IMPACT ASSESSMENT OF THE INTEGRATED NUTRITION PROGRAMME ON CHILD MALNUTRITION IN SOUTH AFRICA

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ABSTRACT

The Integrated Nutrition Programme (INP) was implemented in 1995 to target child malnutrition in South Africa. This study assessed the impact of the INP on child malnutrition by province and age group using secondary data. Data from three national nutrition surveys, conducted in 1994, 1999 and 2005, were used to describe trends in child stunting, underweight, wasting, vitamin A deficiency and iron deficiency. The relationship between the prevalence of the human immunodeficiency virus (HIV) in prenatal women and child nutritional status; challenges and constraints to implementing the INP at provincial level; and government responses to nutrition recommendations by lead experts in the 1994 and 1999 surveys were also investigated.

Child nutritional status varied across provinces. In some provinces such as the Northern Cape, stunting, underweight and wasting remained consistently high. Stunting decreased in the Eastern Cape, but rates of wasting increased between 1994 and 2005. On the other hand, Gauteng and the Western Cape generally had lower rates of malnutrition compared to the other provinces. This may be due to these provinces being the most economically active in the country thus more opportunities for employment and higher purchasing power of foods rich in micronutrients. By 2005, vitamin A deficiency had doubled in most provinces despite mandatory food fortification being implemented in 2003. KwaZulu-Natal had the highest rates of vitamin A deficiency, while Limpopo had the highest rates of iron deficiency. By 2005, malnutrition had decreased in children aged seven to nine years, but had increased in those aged one to three years. There was a significant positive correlation ($p<0.01$) between the prevalence of HIV in prenatal women and vitamin A deficiency nationally. The prevalence of HIV in prenatal women was positively correlated ($p<0.05$) with rates of wasting in children aged one to three years.

Limited skills, inadequate monitoring and evaluation, and limited infrastructure were common challenges and constraints to implementing the INP at provincial level. The effect of HIV on human resources and the higher demands of HIV infected patients also posed a challenge to provinces as they implemented the INP.

Government responded to most recommendations made by nutrition experts. Supplementation, food fortification, growth monitoring and nutrition promotion programmes were implemented.

Based on the data, it would appear that INP activities targeted at school-going children were more effective than those targeting children under-five. Although food fortification was implemented in 2003, the vitamin A content of fortified products might not have met legislative requirements. Additionally, because vitamin A is unstable to heat and light, if vitamin A fortified foods are cooked or stored this may also influence the bioavailability of vitamin A. Maternal HIV status might have attenuated child nutrition outcomes due to the negative effect of HIV on related health conditions such as child caring and feeding practices. Some of the challenges and constraints at provincial level might have negatively affected the implementation of the INP and consequently its impact. Although government responded to most recommendations made by nutrition experts, ongoing monitoring and evaluation of child nutritional status were not adequately done, which might have also negatively affected INP outcomes. In addition, factors in the macro-environment such as food inflation and access to basic sanitation, could have lessened the impact of the INP on child malnutrition.

Interventions directed at malnutrition in children under-five need to be prioritised. There needs to be rigorous monitoring of micronutrient content, especially vitamin A, of fortified foods. Future studies need to include assessment of nutritional status in HIV affected and infected children to help identify specific needs and develop appropriate policies. Frequent nutrition surveillance to assess key child malnutrition indicators is required.

DECLARATION

I, Rufaro Musvaire declare that:

i. The research reported in this mini-dissertation, except where indicated, is my original work.

ii. The research reported has not been submitted for any degree or examination at any other university.

iii. This mini-dissertation does not contain another person's data, pictures, graphs or other information, unless specifically acknowledged as being sourced from such persons.

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…… ……

Rufaro Musvaire Date

As Research Supervisor, I agree to submission of this mini-dissertation for examination:

…… ……

Dr M Siwela Date

As Research Co-supervisor, I agree to submission of this mini-dissertation for examination:

……... …….

Professor SL Hendriks Date

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired immunodeficiency virus
ANOVA	Analysis of variance
DoH	Department of Health
FAO	Food and Agriculture Organisation
GDP	Gross domestic product
GNP	Gross national product
HAST	HIV and AIDS, tuberculosis and sexually transmitted infections
HIV	Human immunodeficiency virus
HST	Health Systems Trust
IFSS	Integrated Food Security Strategy
IMCI	Integrated management of childhood illnesses
INP	Integrated Nutrition Programme
MDG	Millennium Development Goal
NDoA	National Department of Agriculture
NDoE	National Department of Education
NDoH	National Department of Health
NFCS	National Food Consumption Survey
NFCS-FB	National Food Consumption Survey Fortification Baseline
NSNP	National School Nutrition Programme
PEM	Protein energy malnutrition
PMTCT	Prevention of mother to child transmission
PSNP	Primary School Nutrition Programme
RDA	Recommended daily allowance

SADHS	South Africa Demographic and Health Survey
SAHR	South African Health Review
SAVACG	South African Vitamin A Consultative Group
TB	Tuberculosis
UN	United Nations
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION AND STATEMENT OF THE PROBLEM

1.1 Introduction

Food insecurity is a growing concern in many developing countries, with a large proportion of the population in Africa either at risk of, or already facing hunger. Adequate nutrition is an important aspect of both social and economic development, as poor nutritional status directly affects performance, health and survival (de Onis et al., 2004). The main causes of child malnutrition are firstly, protein energy malnutrition (PEM) defined by key indicators of growth namely stunting, wasting and underweight; and secondly, micronutrient deficiencies, especially iron and vitamin A deficiencies (Muller & Krawinkel, 2005). Global estimates indicate just over 50% of under-five child deaths are a direct result of being underweight (de Onis et al., 2004). According to 2005 data, stunting, severe wasting and low birth weight were responsible for 2.1 million (21%) child deaths globally (Black et al., 2008).

Child malnutrition is a major public health concern in southern Asia and most of Africa. Since 1990, the number of hungry people in sub-Saharan Africa has increased by 20% (von Braun, 2005). Between 2000 and 2005, there was an increase in the number of underweight children in this region (von Braun, 2005). Reduction of malnutrition is a key target of the first Millennium Development Goal (MDG), which seeks to reduce the number of underweight children under the age of five years by 50% between 1990 and 2015.

The most useful indicator to determine progress in child health is growth (de Onis et al., 2000). Growth is linked to living standards, food access and health care among other factors, all of which are influenced by national policies (Zere & McIntyre, 2003). Underweight, stunting and wasting are therefore useful in monitoring progress towards the first MDG. Examining trends in the prevalence of micronutrient deficiencies in children helps assess the impact of food security and nutrition policies in a country (Rosegrant & Meijer, 2002), and identify or highlight gaps needing further attention.

South Africa has a high prevalence of child malnutrition. The country has a dual economy in that there is a 'first world economy' in which people enjoy a high standard of living, and a 'third world economy' characterized by poverty and low employment levels, especially in the rural areas. Inequality has contributed to malnutrition in South Africa, where poverty continues to be rife.

No single policy can completely end child malnutrition as food security involves a complex interaction between agriculture, health and other disciplines. Sound policy and significant investment in food security and nutrition could help South Africa eradicate child malnutrition. The primary South African policy aimed at improving food security and reducing malnutrition is the Integrated Nutrition Programme (INP). The INP was implemented in South Africa in 2003 as one of the main initiatives to address malnutrition in vulnerable people, with special focus on children aged under the age of five as well as pregnant and lactating women.

1.2 The importance of the study

Although periodic nutrition surveillance in South Africa assesses nutritional status in children, the success of the INP, with regard to child malnutrition has not been assessed in detail. The only available and relevant study was conducted by Swart et al. (2008), which assessed trends in child malnutrition at provincial level, but not by age group. The study assessed child malnutrition in relation to the primary health care system as a whole, but did not address the INP in detail. It is important to identify the most vulnerable age group in children, so that future food security and nutrition policies can reflect these priorities. The study by Swart et al. (2008) gave a broad picture of provincial trends in child nutrition indicators, but there was no in-depth description and analysis of external factors that may have influenced nutrition outcomes in South Africa. Furthermore, the potential impact of the human immunodeficiency virus (HIV) on child nutrition; challenges in nutrition programming at provincial level; and the extent to which recommendations from nutrition experts have been included in nutrition strategies, particularly the INP have not been evaluated in detail.

It was therefore important to assess the impact of the INP on child malnutrition by analysing trends by province and age group; and to evaluate macro-environment factors probably influencing the outcomes. This could result in improved effectiveness of nutrition programmes.

The conceptual framework of the current study is shown in Figure 1.1 below.

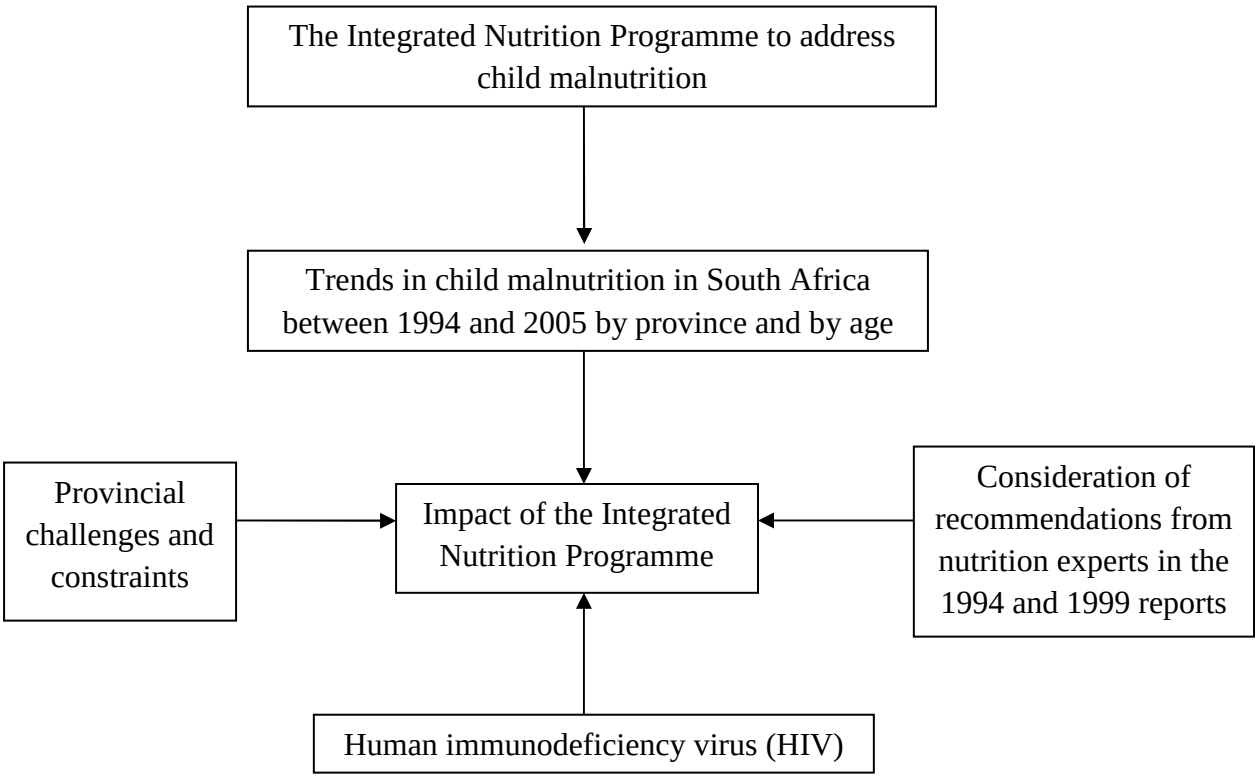


Figure 1.1: Conceptual framework for the study.

1.3 Statement of the research problem

This study set out to assess the impact of the INP on child malnutrition in South Africa in 1994, 1999 and 2005, and to identify macro-environment and nutrition programme-specific factors that may have influenced child nutrition outcomes during these years.

To achieve the above, the following sub-problems were investigated:

Sub-problem 1: To assess the impact of the INP across and within the provinces of South Africa on child nutrition in 1994, 1999 and 2005.

Sub-problem 2: To assess the impact of the INP nationally in South Africa in 1994, 1999 and 2005 when analysed by child age group (one to three; four to six and seven to nine years).

Sub-problem 3: To determine whether there was a relationship between the prevalence of HIV in pregnant women and child malnutrition in 1994, 1999 and 2005.

Sub-problem 4: To identify challenges and constraints affecting the implementation of the INP within provinces and hence evaluate the extent to which they (challenges and constraints) may have affected the impact of the INP on child malnutrition.

Sub-problem 5: To find out whether nutrition experts' recommendations for the INP have been considered in the formulation of INP strategies and other nutrition initiatives.

1.4 Study limits

The study only considered malnutrition in children between the ages of one and nine years in South Africa. The child nutrition data analysed in the study were from three national nutrition surveys conducted in 1994, 1999 and 2005. Prior to 1994, the apartheid era in South Africa saw many black communities marginalized. Therefore, pre-1994 data may not have accurately presented nutritional status in the major racial group in the country. Although some surveys were conducted after 2005, available published national nutrition data were up to 2005 hence this is the cut-off for the current study.

In most cases, an interplay of several factors may affect child nutritional status. Although the researcher explored some external factors that may have impacted on child malnutrition, the main focus of the study was on the INP. Therefore, other possible factors were not in any way exhausted. As such, some of the reasons for the trends in child malnutrition may not have been fully answered and this should be kept in mind when referring to the conclusions.

1.5 Study assumptions

A key assumption in the study was that national nutrition data from the three surveys in 1994, 1999 and 2005 were representative of the general trends of child malnutrition in the country during the period 1994 to 2005. In other words, findings of smaller studies in different regions,

provinces or districts of South Africa in those years would have reflected more or less similar outcomes to those from national surveys.

1.6 Organisation of the mini-dissertation

Chapter 1 presents background information, the research problem and the conceptual framework for the study. Chapter 2 presents a Review of Related Literature followed by a detailed outline of the Methodology used in Chapter 3. The Results and Discussion are presented in Chapter 4. The final chapter presents Conclusions and Recommendations.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

2.1 Introduction

The current study set out to investigate the impact of the INP in South Africa between 1994 and 2005, relating it to indicators of child nutritional status namely, stunting, wasting, underweight, vitamin A and iron status. This chapter will review literature on the importance of child nutrition, the nutrition situation in South Africa and policies. An overview of previous survey findings of child nutritional status in South Africa and a review of some successes of the INP will be provided. This review ends by outlining some of the challenges that could impact on outcomes of the INP.

There are two broad types of malnutrition - undernutrition and overnutrition. The primary focus of this study was undernutrition therefore, the term malnutrition in the present context refers solely to undernutrition.

2.2 The importance of addressing child malnutrition

It has been found universally that the main symptoms and chronic manifestations of malnutrition occur by the age of two in most children (Shrimpton et al., 2001). According to the World Health Organisation (WHO, 2000), the two main causes of malnutrition have been protein energy malnutrition (PEM) and micronutrient deficiencies.

PEM is a problem particularly between the ages of six months and two years, and coincides with the period of most rapid growth and mental development in children. Micronutrient deficiencies during childhood affect growth, compromise immunity and, in severe cases, lead to brain damage, chronic disabilities and mortality. As a result, many researchers consider the ages of six months to two years as a "window of opportunity" to act against malnutrition (Shrimpton et al., 2001; Muller & Krawinkel, 2005). Interventions at this age could prevent some of the negative manifestations of malnutrition, both in the long and short-term (Benson, 2008).

2.2.1 Short-term effects of child malnutrition

It is estimated that more than half of all deaths in children under the age of five are in one way or another linked to poor nutritional status (Rosegrant & Meijer, 2002). Malnourished children

have a higher frequency and duration of infectious diseases (de Onis & Blossner, 1997). Several longitudinal studies have found that under-five children with a low weight for their age have higher mortality rates than children falling within normal ranges (Pelletier et al., 1993). Healthy growth is primarily dependent on nutritional status, which is therefore important in reducing the incidence of morbidity and mortality in young children (de Onis & Blossner, 1997).

According to the Food and Agriculture Organisation (FAO) and the WHO (FAO & WHO, 1992a), vitamin A deficiency is one of the main causes of preventable blindness in children. A deficiency of this vitamin also depresses the immune system rendering children more susceptible to infections such as pneumonia and diarrhoea. Iron deficiency is particularly prevalent among pre-school children in Africa and Asia, and leads to a decline in cognitive ability, consequently resulting in reduced productivity later in life (FAO & WHO, 1992a).

2.2.2 Long-term effects of child malnutrition

The long-term effects of malnutrition in children mainly arise from poor cognitive development, which ultimately affects not only individual productivity, but overall national development. Children with poor nutritional status, even if they become well-nourished later on, are more likely to suffer irreversible effects on development. These children develop into less physically and intellectually productive adults, and are more vulnerable to food insecurity (Rosegrant & Meijer, 2002; Benson, 2008; Ruel & Hoddinott, 2008; Pridmore & Hill, 2009). A study in Zimbabwe by Alderman et al. (2004) found that people who were malnourished as pre-schoolers not only completed 0.7 fewer years of schooling on average, but also earned up to 12% less than those who were adequately nourished as children.

The first MDG “to eradicate extreme poverty and hunger”, with specific target goals of reducing the prevalence of underweight in children by 50% between 1990 and 2015, is clearly indicative of the important role good nutrition has on overall development (de Onis et al., 2004). Progress towards the other seven MDGs is highly dependent on the success of the outcomes in achieving the first goal, so malnutrition is an underlying factor of all the MDGs (Muller & Krawinkel, 2005).

Suboptimal growth during childhood has long-term health, social and economic consequences, besides the more immediate outcomes such as morbidity (Figure 2.1) (de Onis & Blossner,

1997). Although the direct effects of malnutrition are quite clear, the high economic costs of malnutrition are less well known. Nutritional well-being is the most telling of indicators of how well a country is performing in terms of economic, social, agriculture and other sectors as it is a direct input for all these other spheres (FAO & WHO, 1992a). Preventable malnutrition generally undermines investments in education and economic development (Ruel & Hoddinott, 2008). Without adequate nutrition, children are unable to study or be productive at school and this impacts on overall national development. Global estimates indicate that over 3% of global gross domestic product (GDP) is lost due to the effects that iron deficiency anaemia has on the mental abilities of children (Horton, 1999), and that annually 10% of losses in productivity are directly linked to childhood stunting (FAO, 2004).

Due to the multiple factors that can lead to malnutrition, assessing growth in children is considered an indirect measure of the living standards within a population (de Onis & Blossner, 1997). In children, infections and suboptimal feeding practices are the main factors that affect physical growth. Therefore, growth is a useful indicator of overall well-being, and is indicative of a population's ability to meet basic needs such as food, shelter, a clean environment and health services (de Onis et al., 2000).

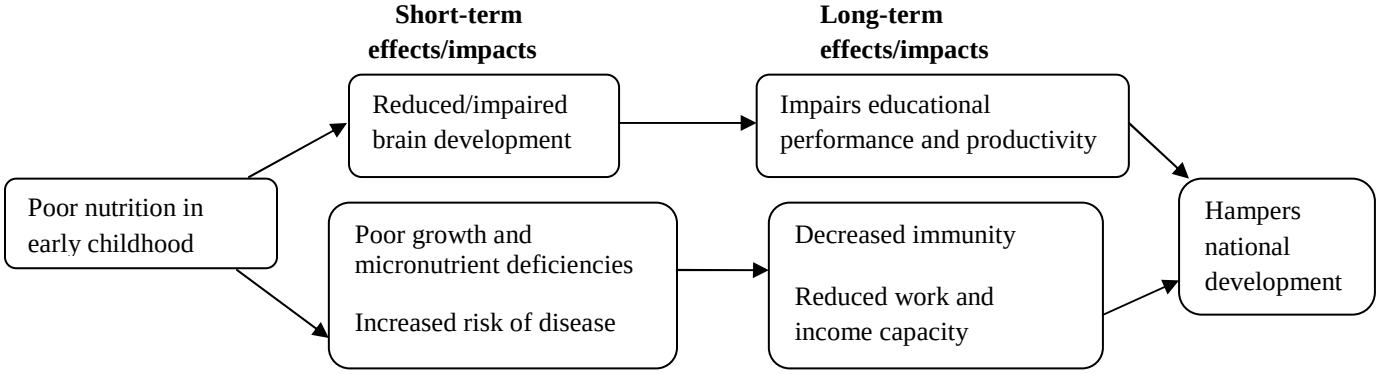


Figure 2.1: The short and long-term effects of poor nutrition during childhood (de Onis & Blossner, 1997)

2.3 The nutrition situation – globally, in Africa and in South Africa with specific reference to child nutrition

According to the United Nations (UN), at least one in every three children aged under-five manifests with at least one indicator of malnutrition (Alderman et al., 2004). In 2004, it was

estimated that stunting, wasting and foetal growth restriction were responsible for over two million deaths globally in children under five (Pridmore & Hill, 2009). A WHO analysis of global trends between 1980 and 2005 showed that stunting, one of the most reliable indicators of chronic or long-term nutritional status in pre-school children (Ruel & Hoddinott, 2008), was decreasing at a rate of less than 1% in most countries, indicating that progress has generally been inadequate in addressing this problem (de Onis et al., 2004).

In 2005, over 30% of children aged under-five in developing countries were stunted, 30% were underweight and 10% were wasted, while millions died directly as a result of micronutrient deficiencies, especially iodine, iron, zinc and vitamin A deficiencies (Muller & Krawinkel, 2005; Ruel & Hoddinott, 2008). Table 2.1 shows some of the global statistics for nutrition indicators in children aged five years and below.

Table 2.1: Global deaths in children under-five years attributed to various malnutrition indicators in 2004 (Black et al., 2008)

Malnutrition indicator	Number of deaths	Percentage of deaths in children under-five
Underweight	1 950 000	19.0
Stunting	1 490 000	14.5
Wasting	1 500 000	14.6
Severe wasting	450 000	4.4
Vitamin A deficiency	670 000	6.5
Iron deficiency	21 000	0.2

Progress in reducing malnutrition has been particularly slow in Africa. It is thought that conflict, natural disasters and, in more recent years, HIV, have significantly hampered progress on the continent, not only in terms of nutrition but also for other development indicators (de Onis et al., 2004; FAO, 2006).

It is estimated that nearly a quarter of the 800 million food insecure people in the world live in sub-Saharan Africa (Love et al., 2006). Sub-Saharan Africa continues to experience high levels

of child malnutrition (Figure 2.2), with an estimated increase of 75% in the number of malnourished children in the region over the last three decades (Rosegrant & Meijer, 2002).

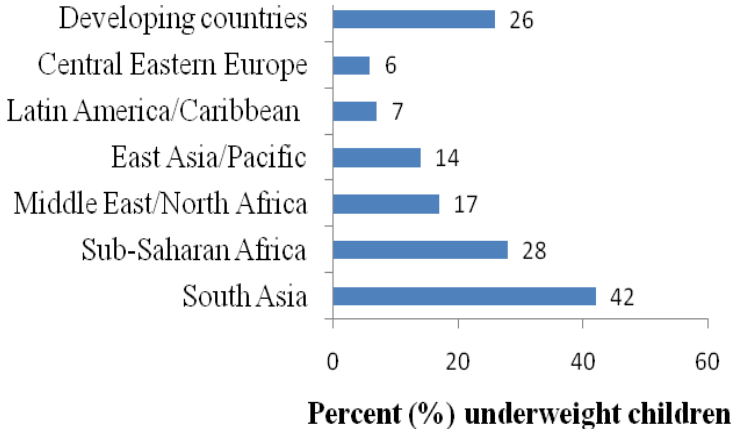


Figure 2.2: Underweight prevalence in children under five by region (2000-2006) (United Nations Children's Fund [UNICEF], 2007).

Nearly 30% of annual child deaths in Africa are linked to undernutrition. If this trend continues, very few countries will be able to achieve the MDG targets by 2015 (Benson, 2008). In fact, at the current rate of progress, it is estimated that many countries in sub-Saharan Africa will only achieve the MDGs in 2050 - a 35 year delay.

Whereas there appears to be an increase in overweight people and obesity in the adult population in South Africa, undernutrition in children continues to be a concern (Faber & Wenhold, 2007). It is estimated that up to 3% of infant deaths in South Africa are directly linked to malnutrition. According to the Health Systems Trust (HST) (1999), undernutrition in South African children often goes unnoticed because it predominantly manifests as 'hidden hunger.' In other words, many children do not present obvious signs and symptoms of PEM such as marasmus and kwashiorkor, yet they have underlying micronutrient deficiencies due to inadequate dietary intake (HST, 1999). About a quarter of children (both pre-schoolers and primary school children) are chronically malnourished (HST, 1999). In 2002, the National Department of Agriculture (NDoA) estimated that the national rate of child stunting was between 20% and 25% in South Africa. Children living in rural areas and on commercial farms are particularly vulnerable to PEM and micronutrient deficiencies (Faber & Wenhold, 2007).

There is wide variation in nutritional status among South African provinces. The Eastern Cape, Limpopo and the Northern Cape have the highest rates of malnutrition in the country (Swart et al., 2008). Over 30% of the South African population has an unstable supply of food, and about 40% of people do not meet their daily energy requirements (NDoA, 2002). This is despite the fact that South Africa has adequate food supplies, with surpluses occurring several times over the past two decades. Therefore, malnutrition and food insecurity are primarily a household level concern.

2.4 The causes of malnutrition in South Africa

The causes of malnutrition in South Africa range from fundamental factors such as inadequate access to resources to more specific, immediate ones such as inadequate access to food (de Onis et al., 2000). The United Nation's UNICEF conceptual framework of the determinants of malnutrition (Figure 2.3) best illustrates the multiple factors that contribute to malnutrition (Benson, 2008). This framework is used to discuss the causes of malnutrition in South Africa.

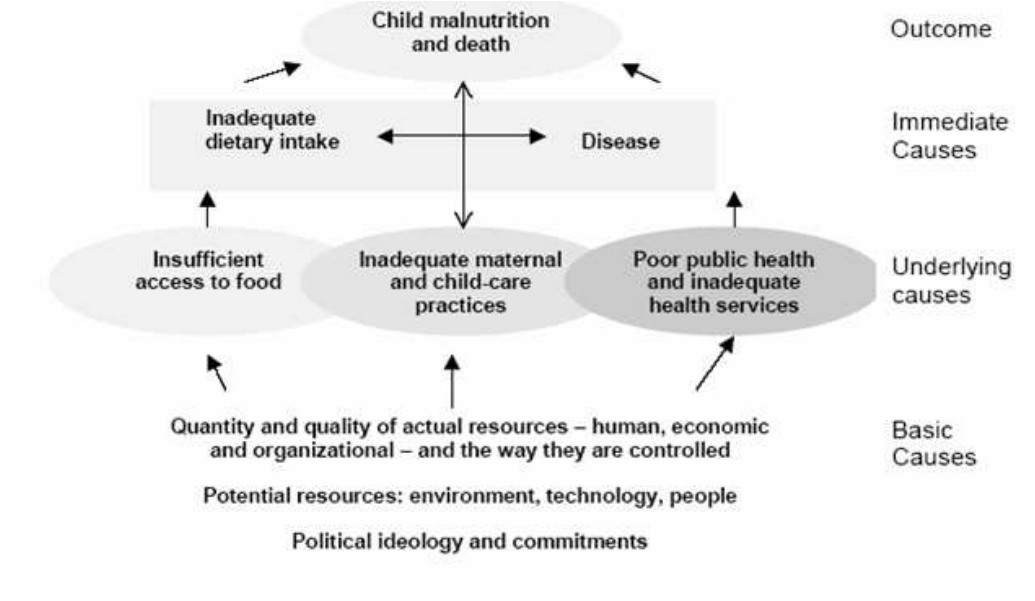


Figure 2.3: The UNICEF conceptual framework of the determinants of malnutrition (Morris et al., 2008, adapted from UNICEF, 1997).

2.4.1 Basic causes of malnutrition

Poverty, malnutrition and hunger in South Africa date back to apartheid policies (NDoA, 2002). Many black people were marginalized and forced to settle in the former homelands with limited

access to resources such as land, and very few viable livelihood options. Homelands were typically marginal land, not well suited to agricultural production and, with no access to markets, production was not profitable (Coovadia et al., 2009). The decline in farming among Africans resulted in decreased wealth and loss of assets, which quickly increased food insecurity and poverty. Black urban dwellers were not much better off due to limited job opportunities and poor education, health and social services. Thus, events prior to 1994 contributed to the current nutrition situation in South Africa (Coovadia et al., 2009). Due to socioeconomic inequalities (60% of the black population faces poverty compared to 5% in the white population), many sections of predominantly black society are still vulnerable to food insecurity (NDoA, 2002).

HIV has also resulted in many socioeconomic changes that have resulted in many households being more vulnerable to malnutrition. For example, a study on 302 sugar mill workers in KwaZulu-Natal found that just over 25% of them were HIV positive (Morris et al., 2000). This high prevalence of HIV among the economically active age group has several effects. Firstly, there is more likelihood of financial strain in a household in which the breadwinner is infected with HIV and at some point is no longer able to go to work. In addition, often the adults die of AIDS leaving behind children without any means of taking care of themselves hence resulting in more orphans and vulnerable children at risk of malnutiriton (de Waal & Whiteside, 2003). A study in Uganda found that more than half of orphaned children were underweight and at much higher risk of malnutrition compared to children whose parents were living (Kikafunda & Namusoke, 2006). This could well be the case in South Africa as well where HIV has had a significant impact on several socioeconomic levels of society.

2.4.2 Underlying causes of malnutrition

Household food security depends on access (financial, physical and social) to food on a consistent and sustainable basis. Access is important because there may be an abundance of food available on the market, but those poor families that cannot afford to purchase it would be food insecure. This is the typical case in South Africa, where nationally there is enough food to feed the population and to meet daily energy requirements yet, nearly half of households experience hunger. The National Food Consumption Survey Fortification Baseline (NFCS-FB) (2005) found that approximately one in three households were at risk of hunger. Rural households were

the most affected, especially in the Eastern Cape, Northern Cape and Limpopo where six in ten households faced hunger in 2005 (NFCS-FB, 2005).

The ability of a household to access food is directly linked to economic status (de Onis & Blossner, 1997). Data from 1996 revealed that nearly a third of households in South Africa spent less than 1000 Rand per month on food. In the poorest provinces, for example in the Eastern Cape, up to 70% of households spent less than 1000 Rand per month on food (NDoA, 2002). A cycle exists between malnutrition and poverty and each is influenced by the other (de Onis & Blossner, 1997). Poor households are more vulnerable to shocks (von Braun et al., 1992), such as droughts and food price increases. These shocks directly influence food security and nutritional status due to the changes they effect with respect to dietary quantity and quality (Smith & Haddad, 2000). Children in poor households tend to respond more negatively to food insecurity than adults. Thus, poverty significantly contributes to child malnutrition in South Africa.

According to the National Department of Health (NDoH, 2002), South African women, especially in rural areas, generally have the sole responsibility to not only prepare food for the family, but also to acquire it (through purchasing or production). Too many responsibilities may render a mother unable to meet other needs such as making time to take a child to the clinic for immunization and growth monitoring. This can negatively impact on a child's nutritional status. Similarly, inadequate dietary intake and care during pregnancy not only affect a woman's nutritional status, but that of the prenatal and neonatal child. Malnourished mothers tend to give birth to low birth weight children with poor nutritional status (Pridmore & Hill, 2009).

Only 10% of infants are exclusively breastfed in South Africa (South African Demographic and Health Survey [SADHS], 2003). Breast milk is the cheapest source of complete nutrition for infants. Poor breastfeeding practices put children, especially from poorer households that cannot afford to regularly purchase baby foods with a similar nutrient composition as breast milk, at higher risk of malnutrition (NDoH, 2002).

Good health is related to access to affordable, quality curative and preventive health services. In 2003, about 80% of infants in South Africa were immunised (SADHS, 2003). Based on these

findings, at least 20% of children are at-risk of infectious diseases which could affect nutritional status as will be discussed later (section 2.4.3).

In 2001, approximately 60% of households had access to piped water on site or in dwelling, while nearly 10% used water from rivers, dams, springs or streams (Statistics South Africa, 2001). In terms of health, lack of access to safe water supplies and inadequate sanitation has significant implications for the spread of infectious diseases, especially diarrhoea in children. These conditions increase susceptibility to malnutrition and compromise immunity.

2.4.3 Immediate causes of malnutrition

PEM and micronutrient deficiencies are directly linked to inadequate dietary intake. PEM occurs when the amount of protein and energy consumed is less than the quantity required for optimal body function (WHO, 2000). Micronutrient deficiencies are due to inadequate intake of vitamins and minerals as well as inefficient absorption by the body (Pridmore & Hill, 2009). Deficiencies in iodine, iron and vitamin A are key public health concerns (FAO & WHO, 1992a). Salt iodisation has significantly reduced iodine deficiency in South Africa, but iron and vitamin A deficiencies continue to be high (Coutsoudis & Coovadia, 2001).

The interplay between the two immediate causes of malnutrition - inadequate dietary intake and illness, tends to create a vicious cycle of malnutrition and infection (Faber & Wenhold, 2007). Infections cause loss of appetite and malabsorption, which in turn increase the body's nutrient requirements. If these requirements are not met through the diet, illness can lead to malnutrition. Malnutrition lowers the body's ability to resist infection by depressing the immune system. This creates a malnutrition-infection cycle, and ultimately a child experiences longer, more severe and more frequent episodes of illness (Faber & Wenhold, 2007).

Although the relationship between HIV status and nutrition outcomes in South African children has not been investigated in-depth, it is likely the malnutrition-infection cycle is exacerbated by HIV. According to the 2005 South African National HIV Survey, the prevalence of HIV was about 6% in children under five. HIV positive children are more likely to suffer from malnutrition due to the multiple effects the virus has on the body (Figure 2.4). Acquired

Immunodeficiency Syndrome (AIDS) affects the ability of HIV infected parents to care for their children, and impacts on livelihoods, leading to food insecurity (de Onis et al., 2004).

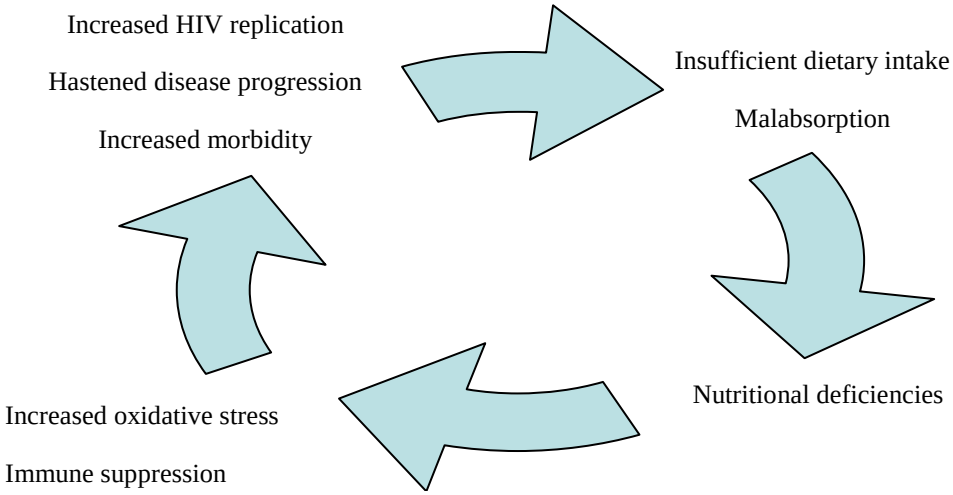


Figure 2.4: The vicious cycle of malnutrition and HIV (Semba & Tang, 1999).

2.5 Nutrition and food security policy

The importance of policy in addressing malnutrition cannot be overemphasized. Effective policies are critical to ensuring household food security (Benson, 2008). Improved policies and more concerted efforts by government and civil society to address food security can result in substantial improvements in nutrition globally, and enhance economic growth and development (Rosegrant & Meijer, 2002).

Economic growth and poverty reduction strategies alone do not always translate to significant improvements in nutrition (Figure 2.5). For example, although per capita gross national product (GNP) significantly increased between 1970 and 1990 in developing countries, there was only a slight reduction in the prevalence of underweight children (Meerman, 2008). Poverty reduction and economic development initiatives need to work hand in hand with nutrition and food security policies. Therefore, government has the important role of ensuring that adequate policies are in place to achieve this synergism (von Braun et al., 1992).

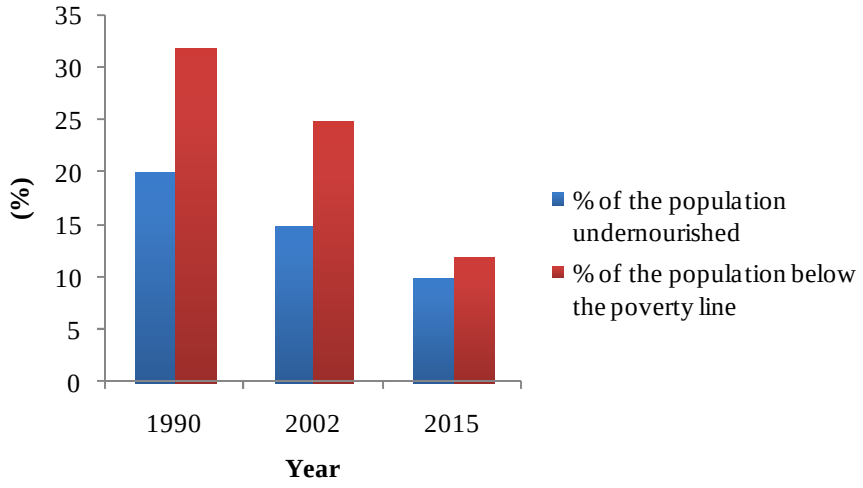


Figure 2.5: Estimated trends in poverty and undernourishment between 1990 and 2015 (FAO, 2006).

Food security requires progressive policy actions that encompass all the determinants of malnutrition (Rosegrant & Cline, 2003; Ruel & Hoddinott, 2008). Ensuring increased food production alone is insufficient to result in any long-term positive nutrition outcomes (Heidhues et al., 2004; Meerman, 2008). Policies that have solely focused on increasing food production without considering other factors such as sanitation, access to food at the household level and availability of health care, have generally failed to adequately resolve malnutrition (von Braun et al., 1992; Love et al., 2006, Ruel & Hoddinott, 2008). Conversely, nutrition activities for example, vitamin A supplementation programmes implemented without collaboration with agriculture, can only prevent malnutrition in the short-term. More sustainable approaches such as increasing dietary diversity through vitamin A enriched vegetables can only be achieved through inter-sectoral collaboration.

According to the World Health Report (2008), and as illustrated by the UNICEF conceptual framework (Figure 2.3), nutritional status is largely determined by social and economic factors. Therefore, the best approach to address malnutrition is to form inter-sectoral linkages. Policies and nutrition activities limited to the health sector cannot solve nutrition problems (Benson, 2008). For appropriate responses to hunger, there needs to be coherence among policies with clearly established objectives and targets for each sector (FAO, 2006).

Globally, there seems to be a limited understanding of the determinants of nutrition status (Benson, 2008). This gap among policymakers may be due to insufficient dissemination of nutrition information to other sectors (Meerman, 2008). For example, the determinants of micronutrient deficiencies and links between disease, micronutrient deficiencies and dietary diversity may not always be well articulated to policymakers.

Another barrier to nutrition being placed high on country policy agendas is limited understanding of the extent to which malnutrition impacts on development (Meerman, 2008). Despite glaring statistics, many governments have failed to prioritise nutrition as a key factor for development (Benson, 2008). The high levels of malnutrition in many developing countries suggest that nutrition might not be high on the policy agenda or at the least; there might be coordination problems such as nutrition not quite fitting into any particular sector (Benson, 2008).

A shortage of resources and qualified personnel to not only drive, but to also monitor programmes is a constraint in successfully achieving nutrition goals. Nutrition surveillance is important for targeting vulnerable groups; directing the correct interventions; monitoring changes in nutrition status; and measuring programme impact (FAO & WHO, 1992b). Hence, it is important to have trained people at grassroots level to effectively implement policies. Capacity development of inter-sectoral teams, able to work across various sectors to identify and address nutrition issues, is therefore imperative (Benson, 2008; Morris et al., 2008).

2.6 South African Food Security Policy and the Integrated Food Security Strategy

An integrated, synergistic approach is required to ensure that both short and long-term approaches to address malnutrition are addressed (Underwood, 1999). General consensus is that integrated strategies result in more sustainability and 'sticking together' of policies. The introduction of an integrated strategy to address food security in South Africa was based on this premise.

The development of a comprehensive food security policy for South Africa began in 1995 and was nested in the NDoA. The Reconstruction and Development Programme identified food security as a priority area. A paper was prepared that outlined the main concerns and possible solutions to ensure food security (Makhura, 1998). The food security vision set out was, "To be a country where everyone has access to adequate, safe and nutritious food" (Makhura, 1998

pp577). Some of the strategic action areas highlighted in the paper were agricultural development and reform; food trade; income enhancement and diversification; social security and welfare services; disaster management; and food consumption and nutrition (Makhura, 1998).

The food security paper led to the development and implementation of many food security programmes by government sectors (NDoA, 2002). Programmes included school feeding schemes; vegetable gardens; community projects; child support grants; and working for water and public works programmes. The government soon realized that a lack of cohesion between sectors undermined desired outcomes (NDoA, 2002). A more integrated strategy was considered to be the best approach to strengthen coordination between sectors. Therefore, in 2000, the formation of an Integrated Food Security Strategy (IFSS) for South Africa was proposed (NDoA, 2002). As shown in Figure 2.6, the IFSS strategy aimed to build stronger partnerships and institutional arrangements between sectors to ensure coordination and structure in addressing food insecurity (NDoA, 2002).

The main goal of the IFSS was to ensure that hunger, malnutrition and food insecurity are eradicated, not only to meet the target of the first MDG, but to ensure permanent food security (NDoA, 2002). The strategic objectives of the IFSS were to increase household food production and trading; improve income generation and job creation opportunities; nutrition and food safety; increase safety nets and food emergency management systems; provide capacity building; and facilitate stakeholder dialogue.

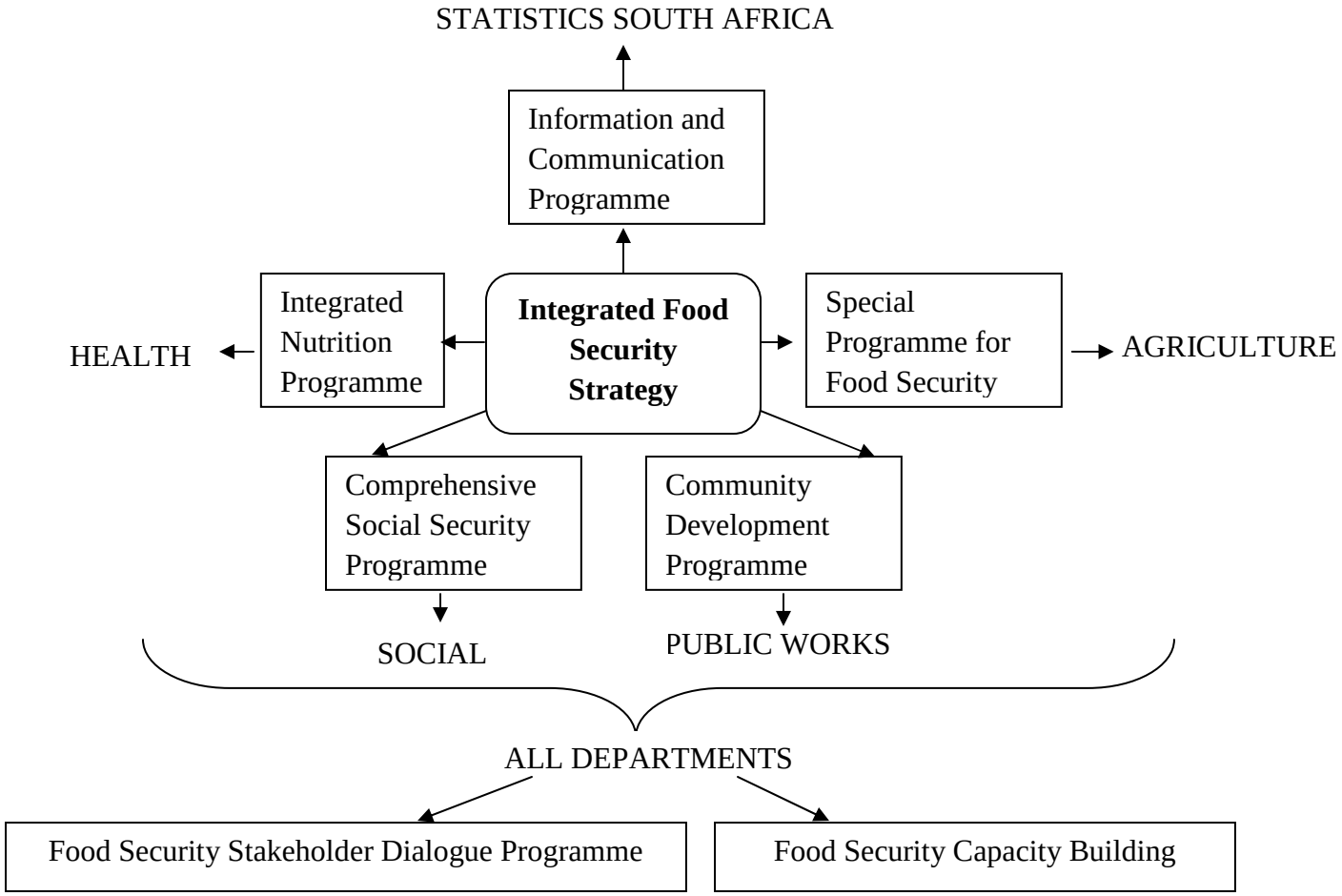


Figure 2.6: Government programmes and departments that form the IFSS (NDoA, 2002).

2.7 The South Africa Integrated Nutrition Programme

Although it now falls under the broader IFSS (Figure 2.6), the INP was developed by the NDoH in 1995 with the primary mandate of targeting malnutrition in a more integrated approach. The UNICEF conceptual framework for determinants of malnutrition was used as a model to apply appropriate interventions for the South African situation (NDoH, 1999).

The INP is the main policy addressing child malnutrition in South Africa. There are eight focus areas of the INP each with strategic objectives that are regularly revised (NDoH, 1999). Key long and medium-term INP strategies that were set in 2004 are shown in Table 2.2.

Table 2.2: Key long and medium-term Integrated Nutrition Programme strategies (NDoH, 2002)

Long-term strategies	**Medium-term strategies**
1. Promotion of healthy lifestyles	1. Implement activities to reach millennium development goals
2. Reduction of child mortality	2. Improve immunization coverage
3. Improve youth and adolescent health	3. Improve management of childhood illnesses
4. Maternal mortality reduction	4. Improve school health services
5. Decreasing malnutrition	5. Strengthen programmes on women and maternal health
6. Nutrition interventions to reduce spread of HIV	6. Improve nutrition services and interventions
7. Nutrition interventions for people with tuberculosis and chronic debilitating conditions	7. Implementation of the HIV and AIDS Comprehensive Plan
8. Improved management of communicable diseases	8. Improve health information management systems
9. Emphasis on millennium development goal targets	9. Improve quality and affordability of medicines
-	10. Establish an integrated food control system
-	11. Strengthen implementation of New Partnership for Africa's Development (NEPAD) and Southern African Development Community (SADC) strategies

INP targets for 2007 for stunting, wasting, underweight, iron deficiency and vitamin A deficiency in children are summarised in Table 2.3, while Table 2.4 shows INP focus areas and strategic objectives (see Appendix A for summarized INP goals and objectives, and Appendix B for detailed strategic priorities). Owing to its strong emphasis on child malnutrition, in general terms, the impact of the INP strategies can be measured primarily through outcomes of child nutritional status.

Table 2.3: Integrated Nutrition Programme (INP) strategic objectives and 2007 targets for anthropometric and micronutrient status in children (NDoH, 2002)

Strategic Objective	Performance indicator	Baseline	Target
To contribute to the reduction of malnutrition in children under five years of age specifically of underweight, stunting and wasting	Proportion of underweight children	Children six months to six years: 9.3% (SAVACG, 1994)	8%
	Proportion of stunted children	Children six months to six years: 22.9% (SAVACG, 1994)	18%
	Proportion of wasted children	Children six months to six years: 2.6% (SAVACG, 1994)	2%
Elimination of micronutrient malnutrition deficiencies among the population focusing on vulnerable population and groups	Vitamin A deficiency measured as the number of children under five with serum retinol <20µg/dℓ	33.3% (SAVACG, 1994)	19%
	Iron deficiency measured as the number of children under five with iron deficiency	10% (SAVACG, 1994)	7.5%

SAVACG: South African Vitamin A Consultative Group

Table 2.4: Integrated Nutrition Programme (INP) focus areas and strategic objectives (Labadarios et al., 2005)

Focus area	Strategic objective
Contribution to household food security	To ensure other sectors receive adequate nutritional support To alleviate short-term hunger in primary school pupils
Disease-specific nutrition support, treatment and counseling	To decrease prevalence of low birth weight and underweight infants To decrease malnutrition in children under-five To decrease mortality rate of children under-five
Food service management	To ensure adequate and culturally acceptable meals
Micronutrient malnutrition control	Elimination of micronutrient deficiencies To decrease the proportion of children with an intake of vitamins and minerals <50% To increase the proportion of households consuming iodized salt

Table 2.4 (continued)

Focus area	Strategic objective
Growth monitoring and promotion	To prevent or decrease growth faltering in children aged zero to 24 months To ensure all new babies receive a growth card
Nutritional promotion, education and advocacy	To improve awareness of the INP To improve nutritional knowledge, practices and attitudes To ensure development of policies contributing to objectives of the INP
Promotion, protection and support of breastfeeding	To increase exclusive breastfeeding To increase percentage of mothers who breastfeed up to 24 months
Support system: a) Nutritional information system b) Human resource plan c) Financial and administrative systems	 To assess nutritional status of population through regular surveys To monitor nutritional status through the District Health Information System To develop and implement the INP human resource plan To adhere to Financial Management Act

2.7.1 Impact of the Integrated Nutrition Programme on child nutrition status

Swart et al. (2008) conducted an analysis of trends in child malnutrition using data from three national surveys, namely the South African Vitamin A Consultative Group (SAVACG, 1994), National Food Consumption Survey (NFCS, 1999) and National Food Consumption Survey Fortification Baseline (NFCS-FB, 2005). The data indicated that stunting decreased nationally from 23% to 18% between 1994 and 2005, while rates of underweight remained more or less the same at 9%. However, the national prevalence of wasting increased slightly from 3% to 4% between 1994 and 2005 (Swart et al., 2008). With respect to micronutrients, apart from improvements in folate and iodine status, a general deterioration in micronutrient status was observed nationally, particularly of vitamin A, iron and zinc in children (SAVACG, 1994; NFCS, 1999; NFCS-FB, 2005).

The trends analysis by Swart et al. (2008) provided a broad picture of national anthropometric status and micronutrient deficiencies. There was no in-depth analysis and description of trends inter- and intra-provincially. Analysing provincial trends would help identify implementation

gaps within provinces. This information would help prioritisation of interventions and allocation of resources to reduce child malnutrition.

Swart et al. (2008) analysed malnutrition trends among all children aged one to nine years rather than breaking them down by child age groups (one to three years; four to six years and seven to nine years). The primary school feeding programme has been evaluated by several investigators (McCoy et al., 1997; Steyn, 1996; Louw et al., 2001; Kloka, 2002; Kloka, 2003) over the years, but it appears that not much was done in terms of assessing the impact of programmes targeted at infants and pre-schoolers. Segregating data by child age group would assist in identifying disparities in nutrition outcomes based on age. Furthermore, it would provide a platform to explore possible reasons for differences in nutritional status, if any, between age groups and assist informed decision-making when formulating strategies. The analysis would enable an assessment of the likelihood that the INP met its 2007 targets for children under-five (Table 2.4).

2.7.2 Contribution of the prevalence of HIV to the impact of the Integrated Nutrition Programme on child malnutrition

The possibility of a relationship between HIV prevalence in prenatal women and nutritional status of children has not been widely studied in South Africa. However, considering the high rates of HIV in the country, it is important to investigate this relationship.

According to the Regional Centre for Quality of Health Care (2003), HIV positive mothers are more likely to give birth to premature infants. Lower maternal energy intakes in relation to higher body demands result in retardation of intrauterine growth. Under sub-optimal growth conditions, mobilisation of micronutrients to the developing foetus is limited. Therefore, whether born with or without HIV, infants born to HIV positive mothers are more likely to have compromised nutrition status, for example, low birth weight and vitamin A deficiencies as discussed earlier (section 2.4.3).

A study in Rwanda by Castetbon et al. (1999) found that HIV positive women gave birth to children who weighed about 0.16 kilograms less than those born to HIV negative mothers. In another study by Moye et al. (1996) in the United States, children who were born with HIV weighed 0.3 kilograms less than HIV negative infants. Even in studies where HIV was not transmitted from mother to child, there was still a higher risk of malnutrition among children

born to HIV positive mothers than those born to HIV negative mothers. For example, in their study in Italy, Agostoni et al. (1998) found that although uninfected children born to HIV positive mothers initially gained weight rapidly at rates similar to other children, over the next two years, children with infected mothers had a higher rate of stunting. This suggests that HIV might significantly affect mothers' abilities to adequately meet their children's health and nutrition needs as discussed previously (section 2.4.3). Nduati et al. (2000) also found an association between HIV positive mothers and increased risk for child malnutrition.

Although several authors have documented a positive association between HIV status in prenatal women and malnutrition in children, not all studies have found this association. Findings from a cohort study in Malawi found no association between maternal HIV status and incidence of stunting and wasting in children (Crampin et al., 2003). Another study also in Malawi (Taha et al., 1995) found that children under three years of age born to HIV positive mothers were not at increased risk of stunting, as did a study in Zambia (Poulter, 1997). These variations in findings of whether there is a relationship between HIV status in pregnant women and nutrition outcomes in children, has led many authors to conclude that the risk may be dependent on the setting.

As aforementioned, to date there does not seem to be any published data regarding this association in South Africa. It would be of interest to government and policymakers to determine whether there was a relationship between HIV prevalence in pregnant women between 1994 and 2005 and rates of child malnutrition.

2.7.3 Achievements and challenges of the Integrated Nutrition Programme

There have been several achievements to date linked to the INP. Among the main ones are universal salt iodisation; food fortification; the District Health Information System; infant and young child policy; food based dietary guidelines; and the National School Nutrition Programme (NSNP).

Universal salt iodisation is mandatory in South Africa since 1995. According to Jooste et al. (2001), the use of iodised salt in South African households increased from under 30% in 1995 to 63% in 1998 and continues to increase. As a result, iodine deficiency disorders especially in children have virtually disappeared in South Africa (Jooste et al., 2007).

Food fortification was successfully implemented and put into legislation in 2003 to address micronutrient deficiencies in young children and other vulnerable groups. It is now mandatory for maize and wheat flour to be fortified with vitamin A, thiamin, niacin, pyridoxine, folate, riboflavin, iron and zinc (Labadarios et al., 2005). Since the inception of food fortification, there has been a significant decline in neural tube defects and other folate-related complications in children (Sayed et al., 2008).

The District Health Information System has now been implemented in most parts of South Africa to help monitor and evaluate programmes at local level (NDoH, 1998). In 2006, the District Health Information System was amended to include assessment of severe child malnutrition in addition to other child nutrition indicators. The first complete set of district level data was published in 2004 in the District Health Barometer. The District Health Barometer aims to support district managers to identify gaps in data quality, inequities in access to healthcare and solutions to poor performance (Barron et al., 2005).

The infant and young child feeding policy was formulated by the NDoH and included implementation of the Baby-Friendly Hospital Initiative to promote breastfeeding. The new Road to Health Chart for growth monitoring was successfully introduced and is now being used in all provinces (Labadarios et al., 2005).

The South African food based dietary guidelines were introduced in 1997 as part of the nutrition promotion focus area (Labadarios et al., 2005). The guidelines were reviewed and it was decided there needed to be separate guidelines for people living with HIV and tuberculosis (TB). As such, HIV/TB food based dietary guidelines were developed, and nutrition interventions targeted at HIV positive people are now also part of the INP strategic priorities (NDoH, 2002). Currently, research is being conducted to formulate dietary guidelines specifically for children.

The NSNP (formerly the Primary School Nutrition Programme [PSNP]), was transferred from the NDoH to the National Department of Education (NDoE) in 2004 (NDoE, 2005). However, since its inception, as part of the INP, at least 15,000 primary schools have been involved in the NSNP (up to 5 million learners annually) (Louw et al., 2001; Labadarios et al., 2005). The NSNP has significantly reduced absenteeism and improved concentration of learners in participating schools (Steyn, 1996; NDoE, 2005).

It is quite evident from the above that the INP has resulted in some positive outcomes. There are however, a number of challenges faced by the INP. In their review of the impact of nutrition interventions in the primary health care system, Swart et al. (2008) identified inadequate human resources and capacity to implement programmes as significant problems in South Africa. A study by Schoeman et al. (2006) at a primary health care facility in the Western Cape found lack of skills and poor dissemination of information as two main problems in targeting nutritionally at-risk children. Nurses were not adequately trained and equipped to conduct nutrition assessments and accurately plot weights of children on the Road to Health Chart (Schoeman et al., 2006). This resulted in many nutritionally at-risk children going undiagnosed (Schoeman et al., 2006). The study found that transfer of information and counselling by health workers to mothers and caregivers was generally weak (Schoeman et al., 2006). This poor dissemination of information might be one of the reasons why, despite having food based dietary guidelines, lack of nutrition knowledge is a recurring phenomenon in South Africa (Coutsoudis & Coovadia, 2001).

Other factors identified by Swart et al. (2008) as affecting the effectiveness of nutrition programmes were: weak coordination; inadequate or unreliable funding; structures that impede collaboration; limited sticking power of policies with respect to implementation; inadequate strategies; and a lack of interest in prioritising malnutrition (Swart et al., 2008). Most of these are generally in line with challenges faced globally as previously discussed (section 2.4.2).

A few researchers have investigated challenges in specific components of the INP. For example, Labadarios et al. (2005) identified lack of capacity within the INP, while Hendricks et al. (2003) found poor targeting and limited access of the most vulnerable groups to INP interventions such as the PEM scheme, to be major hindrances.

Although Swart et al. (2008) identified the abovementioned concerns that can be collectively termed national implementation problems; there could be other challenges and constraints at provincial level. Each province runs its own INP activities in South Africa. It is therefore possible that there are problems within provincial INP structures that could be impeding on the ability of the INP to successfully achieve its mandate. Furthermore, the review by Swart et al. (2008) considered challenges to implementing nutrition programmes within the primary health care system as a whole and not specifically related to the INP. As the main driver of nutrition in

South Africa, it is important to establish INP-specific challenges and constraints and to do this at provincial level as this is where most of the work is done.

2.7.4 Recommendations from national surveys regarding child nutrition

Nutrition experts from each of the three surveys – SAVACG (1994), NFCS (1999) and NFCS-FB (2005), made recommendations to the NDoH based on the survey findings. These recommendations focused on ways in which nutrition programmes could be improved in South Africa, particularly with regard to child malnutrition.

However, it remains to be seen how well government has responded to these recommendations. There does not appear to have been any evaluation conducted to investigate the extent to which the NDoH, particularly through the INP, has taken expert recommendations on board in its strategies and initiatives. There could be gaps in terms of government responses and these gaps may in fact also potentially impact on the success of the INP.

2.8 Summary

As highlighted in the literature review, malnutrition continues to be a problem among children in South Africa. It not only affects health but also hampers economic growth and development. The INP was implemented primarily to address child malnutrition. Findings from three national surveys between 1994 and 2005 indicate that nationally, there have been minimal improvements in child nutritional status. In order for policymakers to make more informed decisions, it is important to conduct a study to describe trends in child malnutrition provincially and by age group. This would help identify the most vulnerable provinces and child age groups in the country. It also remains to be seen whether there was a relationship between the prevalence of HIV in pregnant women and rates of child malnutrition in 1994, 1999 and 2005 in South Africa.

Swart et al. (2008) identified factors within the primary health care system influencing nutrition programmes in South Africa. There could, however, have been factors specific to running the INP particularly at provincial level, which may have affected implementation of the programme. It is also important to establish the extent to which nutrition recommendations by leading experts were addressed by government as this may have had an impact on INP outcomes.

This study is important as it not only assessed the impact of the INP in terms of child malnutrition, but also set out to explore several factors that may have influenced the outcomes of child nutritional status. Findings from the study allowed the researcher to identify potential problem areas within the INP and raise awareness to required improvements. The data and information generated from this study will be useful to policymakers when prioritising interventions for specific age groups and provinces.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Since 1994, national nutrition surveys have been conducted approximately every five years in South Africa. Traditionally, these have mainly assessed nutritional status in children, but more recently (2005) women of child-bearing age have been included. The INP was implemented in South Africa following findings of the SAVACG (1994) study which drew attention to the high rates of malnutrition nationally.

As the primary driver of child malnutrition in the country, the impact of the INP on child malnutrition can be measured based on changes in selected child malnutrition indicators.

The sub-problems of this study, which were stated earlier (section 1.3), were to:

1) Assess the impact of the INP on child malnutrition in South Africa by province.

2) Assess the impact of the INP on child malnutrition in South Africa by child age group.

3) Relate nutrition outcomes in children to HIV prevalence among pregnant women in the three years the nutrition surveys were conducted.

4) Identify challenges and constraints to implementation of INP strategies at provincial level.

5) Investigate the extent to which previous recommendations from key investigators have been responded to by government primarily through INP strategies.

This chapter will review the study design, data collection and method of analysis.

3.2 Study design

This study examined how indicators of child malnutrition in South Africa changed over 11 years between 1994 and 2005 by province and by child age group (sub-problems 1 and 2). The trends were assessed to determine the impact that the INP has had on child nutrition. The technique used in the current study to address these first two sub-problems was a meta-analysis of national nutrition surveys. Many surveys have been conducted to measure nutritional status among South

African children. These surveys range from three large national studies to many smaller *ad hoc* studies at local levels. The nationally representative surveys evaluated in this study were the South African Vitamin A Consultative Group (SAVACG, 1994); National Food Consumption Survey (NFCS, 1999); and National Food Consumption Survey – Fortification Baseline (NFCS-FB, 2005). A meta-analysis is useful when aiming to systematically combine data from several independent studies (Hough & Hall, 1994; van den Bergh & Button, 1997). Meta-analyses are mainly used in the context of statistical analysis of case studies or when putting together data with common indicators to assess changes over time (Geist & Lambin, 2001). Five indicators of child malnutrition were identified by drawing on previous nutrition surveys in South Africa. These indicators were stunting, underweight, wasting, vitamin A deficiency and iron deficiency. Trends for each indicator were analysed.

Both quantitative and qualitative data were used in the study. Data on nutrition indicators and HIV were primarily quantitative in nature, while information on challenges faced by the INP, recommendations from key investigators and INP strategies were qualitative.

Data for the SAVACG (1994), NFCS (1999) and NFCS-FB (2005) studies were formally obtained and used with permission from the KwaZulu-Natal provincial Department of Health (DoH) offices in Pietermaritzburg. These data were used to analyse anthropometrics and micronutrient trends in children under nine between 1994 and 2005 using stunting, underweight and wasting as indicators of anthropometric status, and vitamin A and iron deficiencies as indicators of micronutrient status.

National and provincial data on HIV prevalence among prenatal women in South Africa were obtained at the KwaZulu-Natal DoH HIV and AIDS, Tuberculosis and Sexually Transmitted Infections (HAST) Unit in Pietermaritzburg. Publications of provincial DoH strategic plans (between 2002 and 2005) were accessed through the provincial government websites to identify province-specific challenges and constraints that could have impacted on INP outcomes. The full reports and recommendations from the SAVACG (1994) and NFCS (1999) were compared to the INP strategic plans and South African Health Review (SAHR) publications between 1996 and 2005 to establish the extent to which government has addressed these recommendations.

Table 3.1: Summary of methodological approach

Sub-problem/Objective	Data	Indicators	Method of analysis
To assess the impact of the INP across and within the provinces of South Africa on child nutrition in 1994, 1999 and 2005.	South African Vitamin A Consultative Group (SAVACG) (1994); National Food Consumption Survey (NFCS) (1999); National Food Consumption Survey Fortification Baseline (NFCS-FB) (2005).	Stunting, underweight, wasting, vitamin A deficiency and iron deficiency.	Description of provincial trends through graphical presentation.
To assess the impact of the INP in South Africa in 1994, 1999 and 2005 when analysed by child age group (one to three; four to six and seven to nine years).	SAVACG (1994); NFCS (1999); NFCS-FB (2005).	Stunting, underweight, wasting, vitamin A deficiency and iron deficiency.	Description of age group trends through graphical presentation.
To determine whether there was a relationship between the prevalence of HIV in pregnant women and child malnutrition in 1994, 1999 and 2005.	HIV National Antenatal Seroprevalence Surveys (1994, 1999 and 2005).	HIV prevalence rates of pregnant women. Stunting, underweight, wasting, vitamin A and iron deficiencies in children.	Pearson's correlation.
To identify challenges and constraints affecting the implementation of the INP within provinces hence, evaluate the extent to which they may have affected the impact of the INP on child malnutrition.	Selected provincial Department of Health strategic plans published between 2002 and 2005.	Provincial challenges and constraints.	Tabulated challenges and constraints followed by a discussion.
To find out whether nutrition experts' recommendations for the INP have been considered in the formulation of INP strategies and other nutrition initiatives.	Recommendations: SAVACG (1994) and NFCS (1999) Responses: South African Health Review publications (1996 to 2005); INP strategies.	Recommendations and responses.	Tabulated challenges and responses followed by a discussion.

3.3 Determination of child malnutrition trends

Data from the three national surveys were used to assess child malnutrition indicators. Stunting, underweight and wasting rates in 1994, 1999 and 2005 were described according to the WHO definition which states that a child is stunted, underweight or wasting if the height for age, weight for age or weight for height respectively, falls below two standard deviations of the reference median. Vitamin A deficiency (<20 µg/dℓ serum retinol) and iron deficiency (<11 g/dℓ haemoglobin and <12 µg/dℓ ferritin) were not investigated in 1999, so only two data sets (1994 and 2005) were used to assess iron and vitamin A status in the current study.

The percentages of stunting, wasting, underweight (1994, 1999 and 2005) and percentages of vitamin A and iron deficiency (1994 and 2005) were used for each province with the exception of iron status in 2005 for the Northern Cape where the data were not available. The trends were then described for each indicator within and across provinces.

The SAVACG (1994) study investigated nutritional status in children aged 6 to 71 months while the NFCS (1999) and NFCS-FB (2005) assessed nutrition in children aged one to nine years. In the 1994 study, data were categorised by age group as follows: 6 to 11 months; 12 to 23 months; 36 to 47 months; 48 to 59 months and 60 to 71 months. Data for 1999 and 2005 were, however, grouped as one to three years; four to six years and seven to nine years. Therefore, to make comparisons, the 1994 groups were converted from months to years, with children between 12 and 47 months described as the one to three year group, while those between 48 and 71 months as the four to six year group. The rates of each indicator were summed for example, stunting rates in children 12 to 23 months + stunting in children 24 to 35 months + stunting in children 36 to 47 months, and a mean was calculated to establish the stunting rate in the 'new' group - one to three years. The same approach was used for four to six years.

Since the age cut-off in the 1994 survey was six years, in the current study, the anthropometric data (stunting, underweight and wasting) by age were analysed for children aged one to three years and four to six years for all three studies, and analysed in children seven to nine years only for 1999 and 2005. With respect to micronutrients (vitamin A and iron), only data for one to three years and four to six years in 1994 and 2005 were analysed. As aforementioned, the 1999 study did not assess vitamin A and iron as individual micronutrients. Although the 2005 study included vitamin A and iron status of children aged seven to nine years, this age group had not

been investigated in 1994 hence it has not been possible to describe micronutrient trends for this age group. Therefore, for the purposes of this study, 2005 data on vitamin A and iron in children aged seven to nine years were not included.

3.4 Determination of whether there was a relationship between HIV prevalence in prenatal women and nutrition indicators in children

National and provincial data on HIV prevalence among pregnant women in 1994, 1999 and 2005 were gathered from the annual HIV National Antenatal Seroprevalence Surveys and were used to establish whether there was a correlation between HIV prevalence in pregnant women and children malnutrition.

The correlation between maternal HIV status and child malnutrition was important to establish because several studies (section 2.7.2) have found that children born to HIV positive mothers tend to be at higher risk of malnutrition due to low birthweight. Therefore, although a HIV positive mother may still be healthy enough to provide adequate care to her child, the effects of being HIV positive during pregnancy, for example, less absorption of micronutrients, may have put the child at higher risk of malnutrition than children born to HIV positive mothers. Pearson's correlation analysis was used to determine the relationship between provincial HIV prevalence rates among pregnant women in 1994, 1999 and 2005 and provincial rates of child stunting, underweight, wasting, vitamin A deficiency and iron deficiency. National data on prenatal HIV prevalence in 1994, 1999 and 2005 were analysed against the rates of the abovementioned child malnutrition indicators in different child age groups, also using Pearson's correlation.

3.5 Identification of challenges and constraints in provinces

The DoH strategic plans for KwaZulu-Natal, Mpumalanga, Eastern Cape and Gauteng were used to identify challenges faced in implementing programmes at provincial level. With the exception of the Eastern Cape, these provinces clearly outlined general DoH service delivery problems and those specifically affecting nutrition programmes, an area which was of interest to the current study. The Eastern Cape only cited general DoH challenges and constraints.

These strategic plans were reviewed to establish and group both general challenges and constraints specific to the implementation of INP activities at provincial level. The assumption

was that challenges or constraints identified in the above provinces could be generalized for all nine provinces of South Africa.

3.6 Assessment of government responses particularly through the Integrated Nutrition Programme to nutrition experts' recommendations

Key recommendations (both general and technical) from the SAVACG (1994) and NFCS (1999) studies were identified, summarised and grouped according to the indicator they addressed that is, anthropometric status, vitamin A deficiency or iron deficiency. The recommendations were compared against INP strategies and expert reviews from publications of the SAHR between 1996 and 2005 to establish government responses to each recommendation.

3.7 Data analysis

Microsoft Excel was used to summarise and tabulate data by province and age. Due to the nature of the study (secondary data analysis), raw data had already been statistically analysed and summarised by the principle investigators in the 1994, 1999 and 2005 studies and weighted by province. As a result, for the current study, the overall outputs (presented as percentages) from the surveys were used for data analysis. Descriptive statistics and graphs were used to analyse nutrition trends. Findings from the SAVACG (1994), NFCS (1999) and NFCS-FB (2005) were compared and contrasted to describe child malnutrition trends. One-way analysis of variance (ANOVA) was used to compare the differences between means of each indicator by province and child age group. A pair-wise comparison of means using the Tukey test was used to determine whether there were significant differences in the means of each indicator across provinces and between different age groups. Pearson's correlation analysis was used to determine whether there was a relationship between HIV prevalence in pregnant women and child malnutrition by age and province in 1994, 1999 and 2005.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This study assessed the impact of the INP on child malnutrition in South Africa. Child malnutrition trends were analysed by province and age group. The relationship between child malnutrition and HIV in prenatal women was also investigated. The study explored challenges and constraints affecting the running of the INP within provinces. Lastly, government responses to nutrition recommendations from the 1994 and 1999 surveys were investigated.

4.2 Impact of the Integrated Nutrition Programme on child malnutrition

The impact of the INP was assessed by province and nationally by age group. Section 4.2.1 describes the trends across provinces, while section 4.2.2 describes age group trends.

4.2.1 Impact of the Integrated Nutrition Programme by province

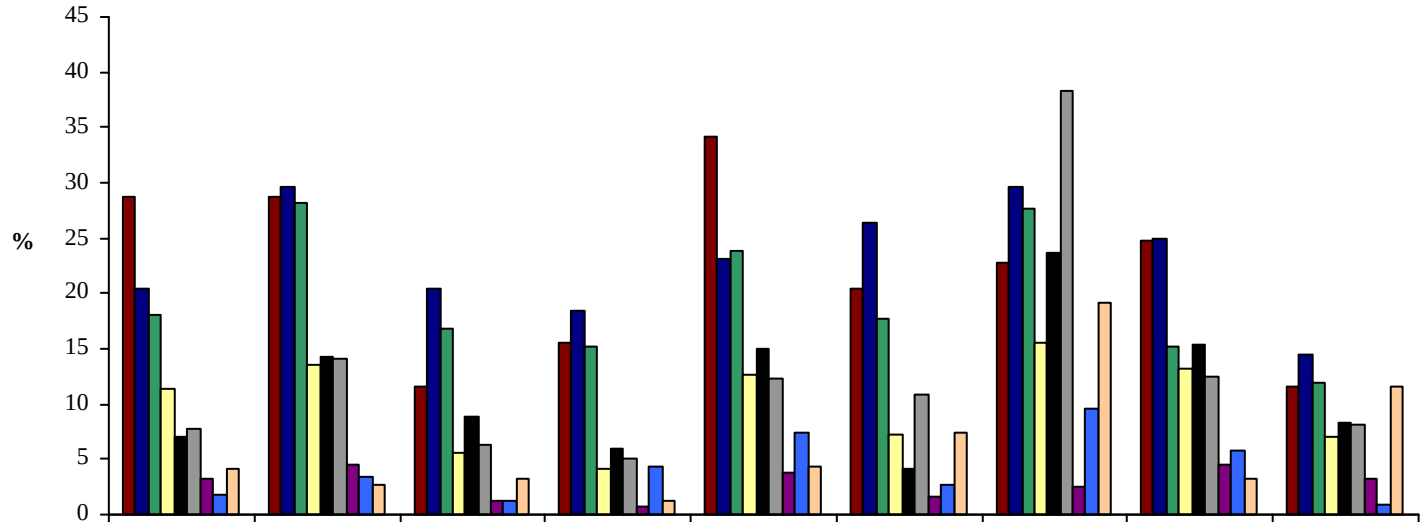
Table 4.1 shows mean rates of stunting, underweight and wasting between 1994 and 2005.

Table 4.1: Comparison of mean stunting, underweight and wasting across provinces using Tukey HSD test

	Averaged malnutrition indicators*								
	EC	**FS**	**GP**	**KZN**	**LP**	**MP**	**NC**	**NW**	**WC**
Stunting	22.4±3.3abc	28.8±0.4a	16.2±2.6bc	16.4±1.1bc	27.0±3.6ab	21.5±2.5abc	26.7±2.0ab	21.6±3.2abc	12.7±0.9c
Underweight	8.8±1.3a	14.0±0.2ab	6.9±1.0a	5.1±0.5a	13.3±0.9a	7.5±1.9a	25.9±6.6b	13.6±0.9a	7.8±0.4a
Wasting	3.0±0.7a	3.6±0.5a	1.9±0.7a	2.1±1.1a	5.2±1.1a	4.0±1.8a	10.4±4.8a	4.5±0.7a	5.2±3.2a

*mean ± standard error; [a, b, c] values in the same row with different letters are significantly different at $p<0.05$; EC=Eastern Cape; FS=Free State; GP=Gauteng; KZN=KwaZulu-Natal; LP=Limpopo; MP=Mpumalanga; NC=Northern Cape; NW=North West; WC=Western Cape.

The mean stunting rate in the Free State was significantly different ($p<0.05$) to Gauteng, KwaZulu-Natal and the Western Cape. With the exception of the Free State, the mean rate of underweight in the Northern Cape was significantly different ($p<0.05$) to all provinces. There were no statistically significant differences in the mean rates of wasting across all provinces in South Africa. Provincial trends in stunting, underweight and wasting are shown in Figure 4.1.



	EC	FS	GP	KZN	LP	MP	NC	NW	WC
Stunting (SAVACG, 1994)	28.8	28.7	11.5	15.6	34.2	20.4	22.8	24.7	11.6
Stunting (NFCS, 1999)	20.5	29.6	20.4	18.5	23.1	26.4	29.6	24.9	14.5
Stunting (NFCS-FB, 2005)	18	28.2	16.8	15.1	23.8	17.8	27.7	15.1	12
Underweight (SAVACG, 1994)	11.4	13.6	5.6	4.2	12.6	7.3	15.6	13.2	7
Underweight (NFCS, 1999)	7.1	14.3	8.8	6	15	4.2	23.7	15.3	8.3
Underweight (NFCS-FB, 2005)	7.8	14.1	6.4	5	12.3	10.9	38.3	12.4	8.2
Wasting (SAVACG, 1994)	3.2	4.5	1.2	0.7	3.8	1.7	2.5	4.5	3.2
Wasting (NFCS, 1999)	1.8	3.4	1.2	4.3	7.5	2.8	9.6	5.7	0.9
Wasting (NFCS-FB, 2005)	4.1	2.8	3.3	1.3	4.4	7.5	19.1	3.2	11.5

Figure 4.1: Provincial trends in stunting, underweight and wasting in South Africa.

EC=Eastern Cape; FS=Free State; GP=Gauteng; KZN=KwaZulu-Natal; LP=Limpopo; MP=Mpumalanga; NC=Northern Cape; NW=North West; WC=Western Cape; SAVACG=South African Vitamin A Consultative Group; NFCS=National Food Consumption Survey; NFCS-FB=National Food Consumption Survey Fortification Baseline.

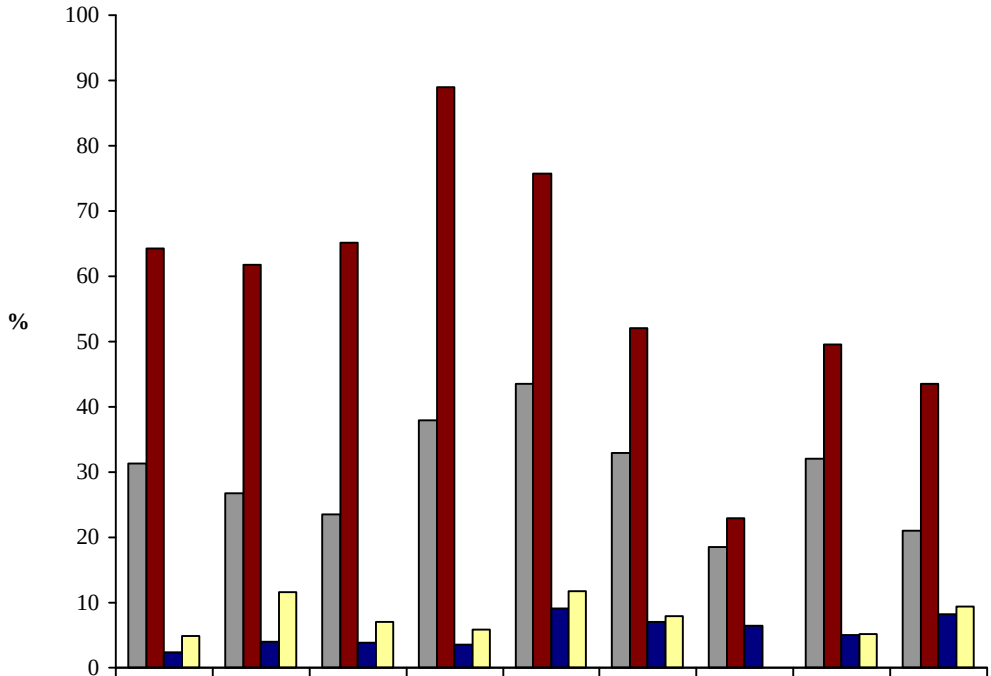
In 1994, stunting rates for most provinces were between 15% and 30%. The exceptions were Gauteng and the Western Cape where stunting was below 15%, and Limpopo which had the highest rates of stunting at nearly 35%. There was a general increase in stunting in South Africa across provinces in 1999, except in Limpopo and the Eastern Cape. These two provinces previously (1994) had the highest rates of stunting, but by 1999, had experienced a nearly 10% decline in stunting. Most provinces had a decrease in stunting in 2005 compared to 1999, although stunting rates in Gauteng and the Northern Cape remained higher than in 1994. In 2005, stunting in KwaZulu-Natal, the Free State and Western Cape returned to similar rates as in 1994. The only province where stunting steadily declined between 1994 and 2005 was the Eastern Cape.

The rate of underweight in 1994 was below 15% in all provinces. KwaZulu-Natal had the lowest rates at just under 5%, and the Northern Cape the highest (15%). Underweight increased in most provinces in 1999 except in the Eastern Cape and Mpumalanga where there was a decrease in the rates of underweight. In fact, in 1999, Mpumalanga had the lowest percentage of underweight children in the country, falling below 5%. Although underweight increased in most provinces in 1999, the rates still remained below 15% in most provinces, except the Northern Cape where underweight increased to nearly 25%. In 2005 underweight rates decreased in Gauteng, KwaZulu-Natal, Limpopo and the North West compared to 1999. There was a slight increase in the rate of underweight in the Eastern Cape in 2005 compared to 1999, but it was still about 5% lower than in 1994. Mpumalanga and the Northern Cape both had increases in underweight in 2005, particularly the Northern Cape where underweight was at over 35%. The rates of underweight in 2005 were, for most provinces, more or less similar to 1994.

Wasting rates in all provinces were below 5% in 1994 with the lowest rates in KwaZulu-Natal and Gauteng, and the highest in the Free State and North West provinces. There was an upward trend in wasting in Gauteng, Mpumalanga and the Northern Cape since 1994, with the Northern Cape recording the highest increases both in 1999 and 2005. Wasting also increased in KwaZulu-Natal, Limpopo and the North West in 1999, but fell again in 2005, although the rates remained slightly higher than in 1994 for KwaZulu-Natal and Limpopo. Rates of wasting decreased in the Eastern Cape and the Western Cape in 1999. However, by 2005, wasting had

increased again in both provinces, particularly in the Western Cape which recorded the second highest rates in the country in 2005. In contrast, the Free State, which in 1994 had the highest rates of wasting in the country, showed a consistent decline between 1994 and 2005. By 2005, the Free State had the second lowest rates of wasting in the country after KwaZulu-Natal.

Figure 4.2 shows provincial trends in vitamin A deficiency and iron deficiency among children in South Africa.



	EC	FS	GP	KZN	LP	MP	NC	NW	WC
Vitamin A deficiency (SAVACG, 1994)	31.3	26.8	23.5	38	43.5	33	18.5	32	21
Vitamin A deficiency (NFCS-FB, 2005)	64.2	61.7	65.2	88.9	75.7	52.1	23	49.6	43.5
Iron deficiency (SAVACG, 1994)	2.4	3.9	3.8	3.5	9.1	7	6.5	5	8.2
Iron deficiency (NFCS-FB, 2005)	4.8	11.6	7.1	5.9	11.8	7.9	-	5.2	9.4

Figure 4.2: Provincial trends in vitamin A deficiency and iron deficiency in South Africa.

EC=Eastern Cape; FS=Free State; GP=Gauteng; KZN=KwaZulu-Natal; LP=Limpopo; MP=Mpumalanga; NC=Northern Cape; NW=North West; WC=Western Cape
SAVACG=South African Vitamin A Consultative Group; NFCS-FB=National Food Consumption Survey Fortification Baseline.

There was an upward trend in vitamin A deficiency in all provinces in South Africa from 1994. By 2005, vitamin A deficiency had doubled in most provinces. In both surveys (SAVACG and

NFCS-FB), the Northern Cape had the lowest rates of vitamin A deficiency in the country, while the highest rates were in KwaZulu-Natal and Limpopo. In 2005, KwaZulu-Natal had a particularly high rate of vitamin A deficiency (nearly 90%) compared to other provinces.

Although there were no data available on iron deficiency for the Northern Cape in 2005, the data showed a general increase in iron deficiency across all other provinces in 2005 compared to 1994. In both 1994 and 2005, Limpopo had the highest rates of iron deficiency, while the Eastern Cape had the lowest. Although in 1994, the Free State was among the provinces with lower rates of iron deficiency; by 2005 it ranked as the province with the second highest rates of iron deficiency in children.

The decline in stunting and underweight, particularly in the Eastern Cape and, to a certain extent in Limpopo, may possibly be attributed to government prioritising child malnutrition in these provinces. One of the recommendations of the SAVACG (1994) study was to allocate more resources and increase interventions in the most vulnerable provinces which traditionally have been the Eastern Cape and Limpopo. In 1994, the anthropometric outcomes in these two provinces, particularly stunting, were much higher than the rest of the country.

The unusually high rates of underweight and wasting in the Northern Cape, especially the sharp increases in 2005, compared to the rest of the country, are of particular interest. This is even more noteworthy considering that 2005 rates of vitamin A deficiency in the Northern Cape were actually the lowest in the country (Figure 4.2). Generally, one would have expected a province with a high rate of PEM in children to have correspondingly high micronutrient deficiency rates. Both forms of malnutrition tend to co-exist and are affected by dietary quantity and quality (Muller & Krawinkel, 2005). In the NFCS-FB (2005), the Northern Cape together with the Easter Cape and Limpopo, were identified as the provinces with the highest number of households (six out of ten) that faced hunger in South Africa. Based on this, it would have been expected that vitamin A deficiency would be much higher among children in the province, yet there was only an increase of about 4.5% between 1994 and 2005. It may have been that micronutrient supplementation programmes in the Northern Cape were more effective in targeting and treating children than INP initiatives such as the PEM scheme and the Integrated

Management of Childhood Illnesses (IMCI) for anthropometric status. However, one cannot unreservedly support the hypothesis that supplementation was effective in the Northern Cape. There were incomplete data for other micronutrients, for example iron, zinc and iodine in 2005 for the Northern Cape. It is therefore difficult to make a valid conclusion without comparing trends in the other micronutrient deficiencies.

All provinces experienced an increase in vitamin A deficiency in 2005 compared to 1994. This increase is somewhat of a surprise considering both vitamin A supplementation and fortification of maize meal and wheat flour with vitamin A are in place in South Africa. The vitamin A supplementation programme targets children under five years of age as well as postpartum women. The high rates of vitamin A deficiency nationally however, suggest there may be some implementation issues affecting the programme. Among some of the issues could be whether correct dosages of the supplements are being administered; availability of supplements within health facilities; and coverage and targeting of the vulnerable groups which was also raised by (Labadarios et al., 2005) and previously reviewed in Chapter 2. The 2003 SADHS found that although vitamin A supplementation was introduced in primary health care services in 2002, on average just over 30% of children aged between 12 and 23 months nationally, received vitamin A supplements in 2003. The highest vitamin A coverage was in the Eastern Cape (45.4%) and the lowest in Gauteng (11.5%) (SADHS, 2003). If this low coverage was maintained over a period of time, this would certainly have contributed to vitamin A deficiency continuing to increase in young children.

In addition, the other factor to consider is the stability of vitamin A. Vitamin A is easily destroyed by exposure to light, oxygen and heat (for example, cooking) which ultimately affects the amount absorbed by the body hence bioavailability (Rodriguez-Amaya, 1997; De Groote & Kimenju, 2008). Therefore, it is also a possibility that storage conditions (exposure to light) of vitamin A fortified foods as well as how they are utilised in the home for example, whether they are first cooked and for how long, may also have an impact on vitamin A levels in children.

Although retinol levels were not measured in the 1999 survey, general intakes of vitamin A were investigated using the method of dietary recalls. With the exception of the Western Cape and Gauteng, the survey found that the mean vitamin A intake of children aged one to three years in South Africa was much lower than the recommended daily allowance (RDA) (NFCS, 1999). Taking this into account, and the apparent lack of success of supplementation programmes, it would appear that approaches to increase food security through dietary diversification would be more effective. Studies in Kenya (Workneh et al., 1999), Ethiopia (Ayalew et al., 1999) and Tanzania (Mulokozi et al., 1999) have found that interventions that promote dietary diversification combined with education are more successful in not only increasing knowledge, but in people complying. This may be because communities are involved in producing their food and this sense of ownership results in more keenness to actually apply the learning and follow the guidelines provided by agriculturalists and nutritionists. Dietary diversification strategies are in the long term more low cost and sustainable than food fortification and, would only require minimal changes to the present dietary habits (Talkuder et al., 2000). Ensuring food security through more agricultural based initiatives working hand in hand with nutrition education to communities would improve micronutrient status as a whole in children. The main concerns that would need to be addressed when considering this approach in children would be identifying foods that would be suitable for children in terms of preferences, organoleptic properties and ease of feeding.

Mandatory fortification of maize meal and wheat flour with selected micronutrients (including vitamin A and iron) was implemented in 2003 in South Africa. The choice of food vehicles was based on survey findings (NFCS, 1999) of the foods most consumed in South African households. Therefore, the general assumption was that the majority of the population would have regular intakes of micronutrients that were added to maize meal and products made using wheat flour for example, bread. However, based on the 2005 survey findings, it would appear that fortification may not be as effective an intervention to improve micronutrient status, particularly vitamin A deficiency in children. There could be several reasons for this, ranging from whether families procure fortified products through to public awareness of fortification, and the actual content of each micronutrient in the fortification mix.

With the increase in food prices over the years, an increasing number of households, particularly in rural areas, may have significantly reduced their intake of bread, and even for example opted to use home-milled maize meal as a means to cut food costs. This would therefore have automatically resulted in a loss of the benefits of fortified products. Findings on food procurement from the NFCS-FB (2005) were that about nine in ten households procured maize meal, seven out of ten households procured wheat flour, and eight in ten households procured bread. From these findings, it would appear that most households in the country have access to fortified products. However, one finding was that the use of cake flour, which is not fortified by law, was very high among consumers especially for baking bread at home. Furthermore, six in ten women who were interviewed in the NFCS-FB (2005) said they did not actively look out for products with the fortification logo when purchasing maize, bread or flour products. Therefore, there may still be gaps in the level of consumer awareness of fortification, and the INP may need to increase campaigns to raise public awareness and knowledge.

Issues around the actual vitamin A content in fortification mixes are directly linked to legislation on quality control. Government legislated that the amounts of each micronutrient to be added to maize and wheat flour had to ensure that at least 33% of the RDAs would be met per serving (NFCS, 1999). It remains unclear how well this has been regulated since the introduction of fortification and whether the standards are being met. The fact that birth defects associated to folate deficiencies have significantly decreased in South Africa suggest that the levels of folate used for fortification are successfully preventing deficiencies. However, for other micronutrients, in particular vitamin A, there is no indication of fortification having reversed or decreased deficiencies. Therefore, there may be issues around the quantities being used in fortification.

Iron deficiency is directly linked to poverty as iron rich foods (mainly meat products) are unaffordable for poor households. Limpopo had the highest rates of iron deficiency in children both in 1994 and 2005. This could as previously discussed have been linked to the higher poverty rates in the province hence more food insecure households with little variety in their

diets. Interestingly the Western Cape, one of the richer provinces in the country based on per capita income, also had high rates of iron deficiency. However, this may be due to the relatively high fish intake among the predominantly coloured population in the province. Fish contains less iron with generally lower biological value than that found in red meat.

Although an iron supplement distribution programme was implemented by the INP for three years to target vulnerable children in 1995, it is to what extent it was successful as there were no follow-up surveys post-supplementation. Furthermore, subsequent INP strategies did not fully articulate other activities, in addition to fortification and the NSNP that would be engaged in to address iron deficiency in children.

From the provincial data, it does therefore generally appear that the INP had varying impacts on different child malnutrition indicators. With respect to child stunting, underweight and wasting, there were improvements in some provinces while others showed deterioration between 1994 and 2005. Generally however, the INP failed to adequately address both vitamin A and iron deficiencies in children in all provinces. By 2005, there were increases across the board in the rates of both deficiencies. The IFSS created a platform for more collaboration between government departments (Figure 2.6) to explore more sustainable solutions, but it is perhaps too early to assess how well the INP and the IFSS have collaborated to fight hunger. It remains to be seen how integrating the INP into the IFSS will impact on child nutritional status in future.
Due to the fact that the success of any programme is influenced by external as well as internal factors, it is important in the context of the INP to also consider these factors. Changes in the macro-environment between 1994 and 2005 might have played a role on nutrition outcomes in children. For example, food inflation between 1994 and 2005 may have impacted on child nutritional status in South Africa.

According to data from the National Agricultural Marketing Council (2005) on food price trends, there was a general increase in the cost of food items between January 2004 and April 2005 in South Africa. Table 4.2 below lists some of the most significant increases during the defined period. As can be seen in the table, micronutrient-dense foods such as fruits and vegetables and

protein rich foods such as meat and chicken experienced the highest price increases between 2004 and 2005. In fact, the costs of all fruits (except for bananas and selected types of apples such as Granny Smith) increased in 2005. It is likely that poorer families can no longer afford these foods compared to previous years. As a result, both micronutrient and protein energy intake of young children in these households would be compromised. Ultimately, susceptibility of children from these households to PEM, vitamin A and iron deficiencies would increase.

Table 4.2: Percentage increase in food items between 2004 and 2005 (National Agricultural Marketing Council, 2005)

Food	Percentage (%) increase
1kg beef	13.9
1kg tomatoes	11.0
1kg oranges	10.0
30 eggs	4.5
1kg carrots	6.3
1 whole chicken (fresh)	5.5

Figure 4.3 shows household food expenditure for different income groups in 1995 and 2000 in South Africa. As shown in the graph, lower income households spent a higher proportion of their income on food compared to wealthier households. As a result, any food price increases during that period, would likely have forced poorer households to limit their diets to a small selection of foods or reduce quantities compared to higher income households. This would have had nutritional implications, especially for young children who require adequate intakes of energy and micronutrients for growth and development.

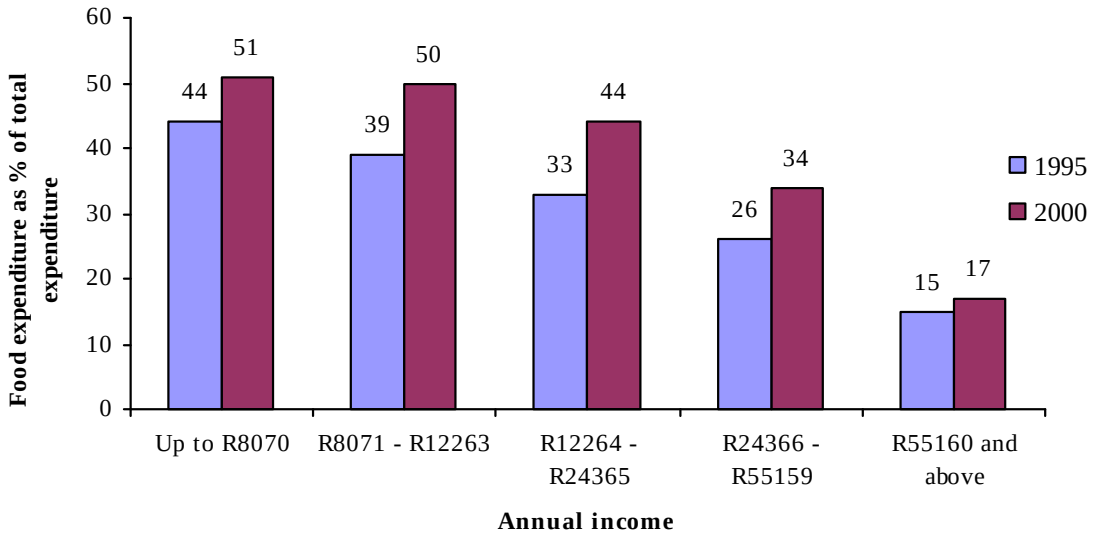


Figure 4.3: Food expenditure in South Africa in 1995 and 2000 (Statistics South Africa, 2002).

4.2.2 Impact of the Integrated Nutrition Programme by child age group

Table 4.3 shows the mean rates of stunting, underweight and wasting in different child age groups between 1994 and 2005 in South Africa.

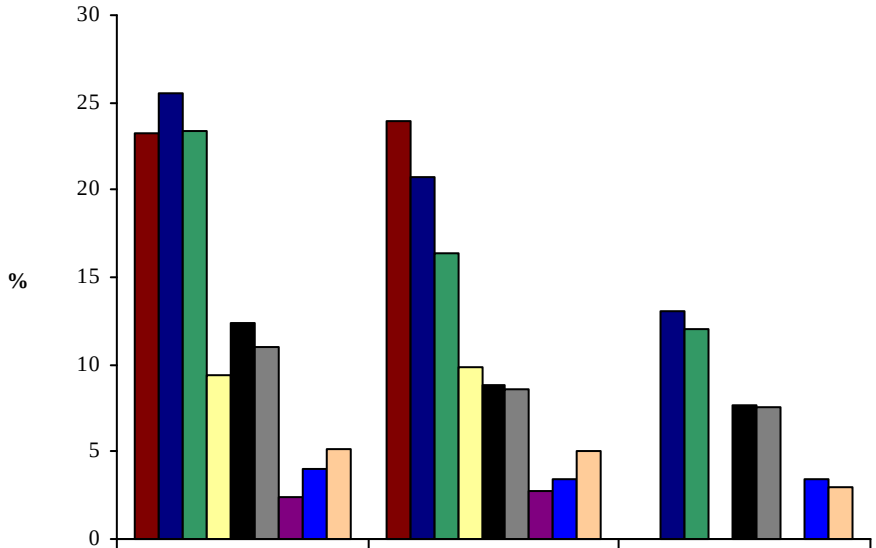
Table 4.3: Comparison of mean stunting, underweight and wasting in different child age groups using Tukey HSD test

	Averaged malnutrition indicators		
	1 to 3 years	**4 to 6 years**	**7 to 9 years†**
% Stunting	24.1±0.7*a	20.3±2.2a	12.5±0.5b
% Underweight	10.9±0.9a	9.1±0.4ab	7.7±0.1b
% Wasting	3.8±0.8a	3.7±0.7a	3.2±0.2a

† mean of 1999 and 2005 findings as nutrition status in children aged 7 to 9 years was not investigated in 1994; * mean ± standard error; [a, b] values in the same row with different letters are significantly different at $p<0.05$.

A comparison of the mean rates of stunting, underweight and wasting in age groups showed there was a significant difference ($p<0.05$) in the mean rates of stunting between children aged seven to nine years and those in the one to three years and four to six years categories (Table

4.3). The mean rate of underweight was also significantly different ($p<0.05$) between one to three year olds and seven to nine year olds. There was no significant difference in mean wasting rates in all three age groups. Age group trends in anthropometric parameters are shown in Figure 4.4.



	1 to 3 years	4 to 6 years	7 to 9 years
Stunting (SAVACG, 1994)	23.3	23.9	-
Stunting (NFCS, 1999)	25.5	20.7	13
Stunting (NFCS-FB, 2005)	23.4	16.4	12
Underweight (SAVACG, 1994)	9.4	9.8	-
Underweight (NFCS, 1999)	12.4	8.8	7.7
Underweight (NFCS-FB, 2005)	11	8.6	7.6
Wasting (SAVACG, 1994)	2.4	2.7	-
Wasting (NFCS, 1999)	4	3.4	3.4
Wasting (NFCS-FB, 2005)	5.1	5	3

Figure 4.4: Age groups trends in stunting, underweight and wasting in South Africa.

SAVACG=South African Vitamin A Consultative Group; NFCS=National Food Consumption Survey; NFCS-FB=National Food Consumption Survey Fortification Baseline; - ≡ no information.

Stunting rates decreased in older children (aged four and above) in South Africa between 1994 and 2005, but less so among one to three year olds. In this age group, stunting increased by

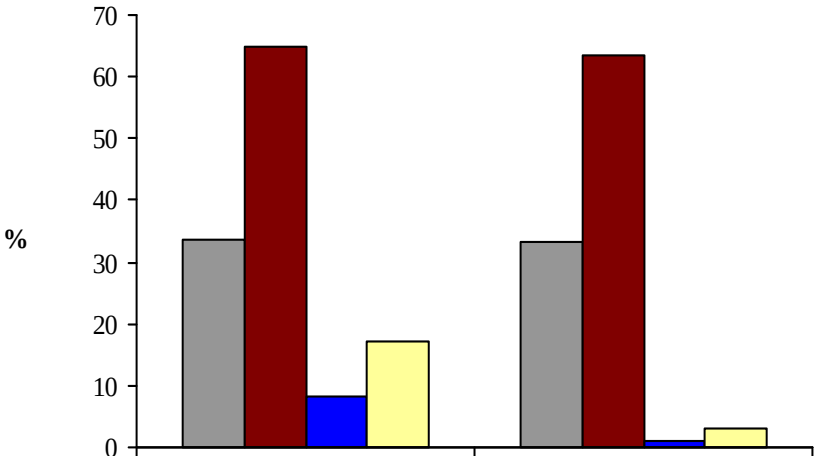
about 2% in 1999 and returned to 1994 rates in 2005. The largest decrease in stunting was in children aged between four and six years, where by 2005 it had decreased by 7.5%.

In 1994, rates of underweight were similar between children aged one to three years and those four to six years of age at 9.4% and 9.8% respectively. In both 1999 and 2005, the proportion of underweight children aged four to six years decreased. On the other hand, in 1999 there was a 3% increase in rates of underweight among children aged one to three years, followed by a slight decrease to 11% by 2005. Children aged seven to nine years consistently had the lowest rates of underweight which remained at just over 7.5%.

Wasting increased in 1999 and 2005 both in children aged one to three years and those four to six years, from around 2.5% in both groups in 1994 to double that by 2005. In sharp contrast, while wasting increased in children aged six years and below, it decreased in children aged seven to nine years from about 3.4% in 1999 to 3% in 2005, making it the age group that had the lowest rates of wasting.

Figure 4.5 shows age group trends in vitamin A deficiency and iron deficiency in South Africa. Vitamin A status in South African children showed a marked, but equal deterioration between 1994 and 2005 among children aged one to three years and four to six years. Vitamin A deficiency increased from just over 30% in 1994 to double that (about 65%) by 2005 in both age groups.

Although iron deficiency showed an upward trend from 1994 to 2005 both in children aged one to three years and those four to six years, the magnitude of increase was quite different between the two groups. Iron deficiency was much higher (in both years) in children aged one to three years compared to those four to six years of age. In 1994, the rate of iron deficiency was around 8% in children aged one to three years and 1% in children aged four to six years. In 2005 however, the rate of iron deficiency increased to 17% and 3% in children aged one to three and four to six years respectively.



	1 to 3 years	4 to 6 years
Vitamin A deficiency (SAVACG, 1994)	33.7	33.2
Vitamin A deficiency (NFCS-FB, 2005)	64.8	63.6
Iron deficiency (SAVACG, 1994)	8.1	1.1
Iron deficiency (NFCS-FB, 2005)	17.2	3.2

Figure 4.5: Age group trends in vitamin A deficiency and iron deficiency in South Africa.

SAVACG=South African Vitamin A Consultative Group; NFCS-FB=National Food Consumption Survey Fortification Baseline.

Based on the age group data, although no data were available for children aged seven to nine years for 1994, it appears that INP goals for older children (seven years and above) were successfully achieved. Efforts with respect to younger children however did not yield as many positive outcomes. There were generally minimal shifts in stunting and underweight in children aged one to three years and wasting increased both in children aged one to three and those aged four to six years of age.

When compared to older children, young children are less empowered to make their own food choices, or to state or express their hunger. This means that the nutritional status of children under three primarily depends on the caregivers. The INP identified nutrition promotion and

education of caregivers as an important strategy for child nutrition. However, based on the nutrition outcomes of young children, it does not seem that these activities have contributed to any meaningful changes. Malnutrition continued to increase from 1994 in the youngest children.

One of the key interventions that could explain the difference in nutritional status between different age groups in children is the NSNP. As mentioned above (section 2.7.3), the NSNP was implemented to target nutrition in school-going children (six to 12 years). According to the SAHR (2000), over 4 million learners had benefited from the programme by 2002 during the time it was under the control of the NDoH (the NSNP is now run by the NDoE). Although many past evaluations (Steyn, 1996; Louw et al., 2001, Labadarios et al., 2005) have shown positive outcomes linked to the NSNP, there does not appear to be much documentation on how well feeding programmes for children under five (for example the PEM scheme) have been implemented.

The main difference between the NSNP and feeding programmes for children under five is that most supplementary foods for this age group are distributed at clinics. In other words, children first have to be taken to a clinic and display symptoms of malnutrition in order for malnutrition to be diagnosed – only then can they be treated with an appropriate intervention such as the PEM scheme. The problem with conducting interventions at clinics alone is that not all vulnerable children regularly go for growth monitoring. This may be due to several factors, which include the distance and costs involved in travelling to the health facility; caregivers may be too busy or at times unaware of or uneducated about the importance of such health check-ups. For example, the 1998 SADHS found that only 54% of uneducated mothers (never been to school) took their children for immunization and regular check-ups at health facilities compared to 73% of mothers who had matriculated (SADHS, 1998). This means an important segment of children who were most at risk of malnutrition may not have been identified and measures taken to prevent or treat malnutrition in 1998. As a result, the rates of malnutrition would naturally have increased or at the least, shown little improvement mainly in younger children.

Whereas most nutrition programmes for infants and pre-schoolers are conducted at health facilities, the NSNP directly targets all children at schools. Hence, the NSNP is able to reach more children, and ultimately works better to prevent malnutrition in children as opposed to

being a therapeutic measure to treat a malnourished child. This distinct difference between the running of INP programmes for younger and older children may have contributed to the differences in nutrition outcomes between children under five and those older. The NSNP targeted more children and in doing so, managed to lower malnutrition in school-aged children between 1999 and 2005.

The pattern of increase in vitamin A and iron deficiencies according to age group was similar to that at provincial level. However, both in 1994 and 2005, children aged one to three years had higher rates of both vitamin A and iron deficiencies compared to children aged four to six years. As previously discussed, this trend is quite surprising considering that food fortification and supplementation programmes were already in place by 2005. One would have expected, at worst, no change in micronutrient status but not marked increases in deficiencies. Although the increase in the cost of nutrient-dense foods (Table 4.2) may, as previously discussed, have played a role, another factor that could have compromised micronutrient status of children is parasites, especially in younger children.

From inception, one of the INP strategies was to concurrently run the micronutrient malnutrition control initiatives with other activities such as parasite control. However, to date there is little evidence to show how well parasite control was implemented (SAHR, 2002). In some provinces, in the 1998 SADHS survey, more than 50% of households (Table 4.4) did not have potable water within or around their households and had to fetch water for everyday use. Depending on the source of water, this could have increased susceptibility to intestinal parasitic infections. Parasites, particularly those that attack the gastrointestinal tract, tend to cause diarrhoea or feed on nutrients within the body, which leads to micronutrient depletion (Lunn & Northrop-Clewes, 1993). Such infestation subsequently results in a vicious cycle of malnutrition and disease (section 2.4.3).

As shown in Table 4.4, the Eastern Cape and Limpopo had the highest proportion of households fetching water while the least was in the Western Cape (SADHS, 1998). An important observation in this survey was that the provinces that had more people using alternative water

sources outside their dwelling, also tended to have higher cases of diarrhoea among children aged 59 months and below (Table 4.4).

From Table 4.4, it is clear that diarrhoea may have a significant impact on micronutrient status in children, and may contribute to the high rates of vitamin A and iron deficiencies. This once again raises the fact that an inter-sectoral approach is needed for the INP to have an overall positive impact on child health.

Table 4.4: Lack of access to potable water within dwellings by province and reported cases of diarrhoea in children under five years two weeks prior to the survey (SADHS, 1998)

Province	Lack of access to potable water	% of children under six years with diarrhoea
Eastern Cape	59.3	12.7
Free State	11.3	9.1
Gauteng	11.5	9.4
KwaZulu-Natal	54.3	17.8
Limpopo	62.1	14.6
Mpumalanga	32.8	16.2
Northern Cape	10.1	10.4
North West	41.0	12.2
Western Cape	3.8	9.9

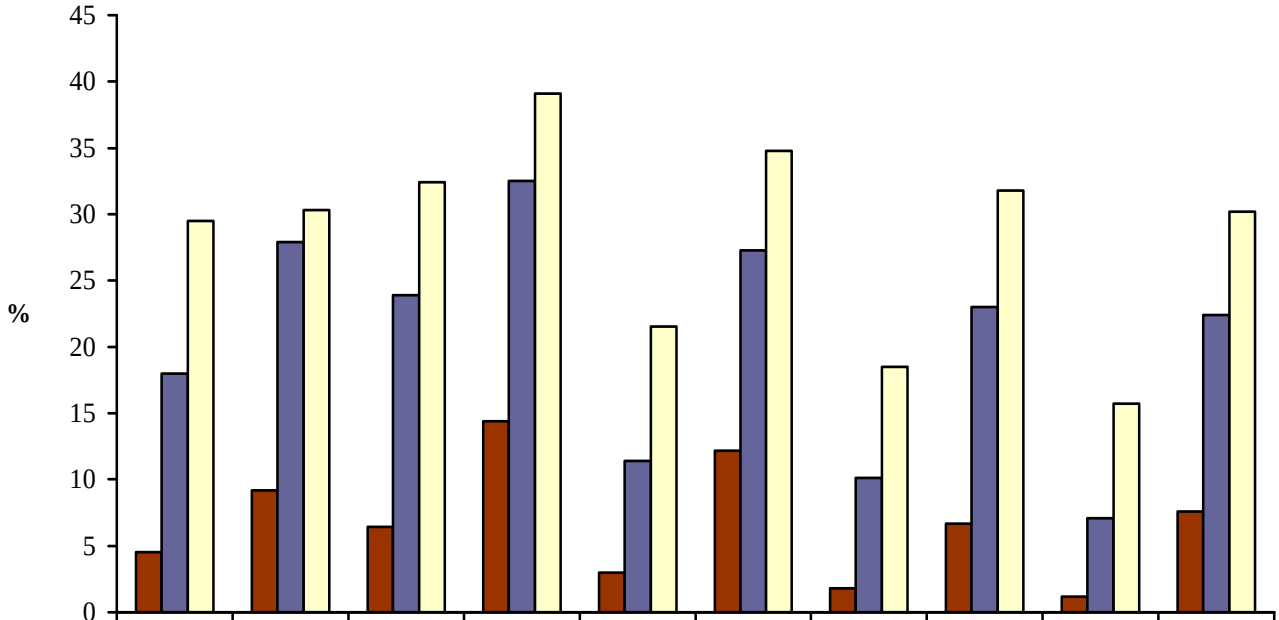
Many determinants play a role on overall nutrition status. Therefore, external factors outside of the health sector also need to be addressed, for example sanitation and access to economic resources as modelled in the UNICEF conceptual framework (Figure 2.3). Malnutrition may also be further exacerbated by the increase in rural to urban migration which results in more informal settlements that are accompanied with poor service delivery for example, inadequate water supply in those dwellings. When these other factors at the macro-level are not addressed, this exclusion hinders the ability of the INP to effectively curb malnutrition. In other words,

there might have been relatively few problems *per se* in implementing the INP between 1994 and 2005, but external influences may have somewhat prevented the true potential of the INP from being achieved. Clearly therefore, the importance of a strategy such as the IFSS that aims to employ an inter-sectoral approach to address food insecurity cannot be overlooked.

HIV may also have influenced nutrition outcomes in children and this is explored further in the section that follows.

4.3 Determining whether there was a relationship between HIV prevalence in prenatal women and child malnutrition trends in South Africa

The following section investigates the possible relationship between HIV prevalence in pregnant women and trends of child malnutrition.



	EC	FS	GP	KZN	LP	MP	NC	NW	WC	National
1994	4.5	9.2	6.4	14.4	3	12.2	1.8	6.7	1.2	7.6
1999	18	27.9	23.9	32.5	11.4	27.3	10.1	23	7.1	22.4
2005	29.5	30.3	32.4	39.1	21.5	34.8	18.5	31.8	15.7	30.2

Figure 4.6: HIV prevalence in prenatal women in South Africa by province (South African HIV Antenatal and Seroprevalence Surveys 1994, 1999 and 2005).

EC=Eastern Cape; FS=Free State; GP=Gauteng; KZN=KwaZulu-Natal; LP=Limpopo; MP=Mpumalanga; NC=Northern Cape; NW=North West; WC=Western Cape.

Figure 4.6 shows an upward trend in HIV among pregnant women across all provinces. KwaZulu-Natal and Mpumalanga consistently had the highest rates of HIV, while the Western Cape, the Northern Cape and Limpopo had the lowest. The mean national prevalence of HIV in prenatal women quadrupled between 1994 and 2005. Table 4.5 shows correlations between the national mean HIV prevalence in prenatal women and national rates of different child malnutrition indicators.

Table 4.5: Pearson's correlation coefficients between national HIV prevalence in prenatal women and child malnutrition indicators

	HIV prenatal	Stunting	Underweight	Wasting	Vitamin A deficiency	Iron deficiency
HIV prenatal						
Stunting	-0.149[a] (0.459)[b]					
Underweight	-0.153 (0.446)	0.547** (0.003)				
Wasting	0.000 (1.000)	0.235 (0.237)	0.791** (0.000)			
Vitamin A deficiency	0.816** (0.000)	-0.114 (0.654)	-0.309 (0.212)	-0.186 (0.459)		
Iron deficiency	0.216 (0.404)	0.128 (0.624)	0.257 (0.320)	0.363 (0.152)	0.392 (0.120)	

[a] Pearson's correlation coefficient (r); [b] p value; ** Significant at p<0.01.

National prevalence of HIV in prenatal women was significantly positively correlated (p<0.01) to the national rate of child vitamin A deficiency. Table 4.6 shows correlations between HIV in prenatal women and malnutrition in children aged one to three.

Table 4.6: Pearson's correlation coefficients between HIV prevalence among prenatal women and malnutrition in children aged one to three years old

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	0.216[a] (0.862)[b]			
Underweight	0.674 (0.530)	0.867 (0.332)		
Wasting	0.998* (0.045)	0.146 (0.907)	0.620 (0.574)	

[a] Pearson's correlation coefficient (r); [b] p value; * Significant at $p<0.05$.

There was a significant positive correlation ($p<0.05$) between HIV prevalence in pregnant women and wasting in children aged one to three years. There were no correlations between the prevalence of HIV in prenatal women and child malnutrition in provinces and in children aged four to six years and seven to nine years (refer to Appendix C for the other correlations).

As abovementioned, there were no statistically significant correlations between HIV in pregnant women and child malnutrition at provincial level. This apparent lack of significance may have been due to the small sample size used in the analysis. There were only data for three surveys (1994, 1999 and 2005) per province for each indicator, and such a small pool would make it difficult to derive any strong associations. Therefore, the findings may be a bit tentative, especially considering that the HIV data and child malnutrition data did not originate from the same surveys. However, the two positive correlations observed (HIV in prenatal women and vitamin A deficiency in children, and HIV in prenatal women and wasting in children aged one to three years); do suggest there may be a link between HIV prevalence in pregnant mothers and outcomes of child malnutrition in South Africa.

Of particular note was the statistically significant ($p<0.05$) positive relationship between HIV in prenatal women and wasting in children aged one to three years in South Africa. The diminished ability of HIV positive mothers to care for their children may be one of the key factors contributing to malnutrition in young children. According to Patrick (2000) citing Cunningham-Rundles et al. (1996), research in New York found that nearly three quarters of HIV positive

mothers gave birth to children who had growth faltering regardless of the children's HIV status. Illness limits mothers' capabilities to adequately meet the nutrition needs of their children (Agostoni et al., 1998; Bachmann & Booysen, 2003) and as mentioned previously, pre-school children tend to be most affected because of their high dependency on caregivers. This would therefore, partly explain why there was a relationship between HIV prevalence in prenatal women and wasting in children aged one to three years in South Africa. HIV positive mothers may have been too ill to provide adequate nutrition for their children (Bachmann & Booysen, 2003).

Furthermore, children in HIV affected households already experiencing poverty would have been more vulnerable to long-term food insecurity and malnutrition. HIV depletes financial resources due to the high costs of caring for HIV patients (Bachmann & Booysen, 2003). As a result, there is less money to purchase food items that are important to meet the growth needs of young children. This increases susceptibility to malnutrition, and the incidence of PEM as was the case in South Africa where wasting was highest among one to three year olds.

Pearson's correlations for vitamin A and iron by province and age group were excluded as there were only two sets of data (1994 and 2005). However, a correlation was conducted at national level using eighteen values (two data sets for each of the nine provinces) for both vitamin A and iron. A significantly positive correlation ($p<0.01$) was found between national HIV prevalence in prenatal women and national rates of vitamin A deficiency in children.

The relationship between HIV prevalence in pregnant women and outcomes of vitamin A status in children may have been due to several factors. Firstly, pregnant women already have higher micronutrient requirements than the average individual; these requirements increase much more when a person is HIV positive (Semba & Tang, 1999; AIDSInfo, 2009). In fact, HIV positive people have higher demands for antioxidants in general as the immune system is forced to work much harder than normal to preserve immune function (Liang et al., 1998; Sepulveda & Watson, 2002). Therefore, if dietary intake of vitamin A rich foods was not increased to match utilisation, there would have been a greater chance of HIV positive pregnant women in South Africa giving birth to children with suboptimal vitamin A status. Furthermore, these mothers

would also have produced breastmilk with low levels of vitamin A (Nestel & Nalubola, 2003), which would have further compromised the vitamin A status of children.

The possible link between vitamin A and HIV could also explain the unusually high increase in vitamin A deficiency in children, especially in KwaZulu-Natal (Figure 4.2). Vitamin A levels have been found to be depleted in HIV positive individuals (Regional Centre for Quality of Health Care, 2003), so in a province such as KwaZulu-Natal, which had the highest prevalence of HIV in prenatal women, children born to these mothers would most likely be vitamin A deficient due to the reasons mentioned above. The NFCS-FB (2005) also found that six out of ten women in KwaZulu-Natal had poor vitamin A status. This further supports the close association between maternal vitamin A status and child vitamin A status, particularly in the context of HIV.

Based on the observed correlations and the fact that several studies, as reviewed in section 2.7.2, have drawn different conclusions regarding an association between HIV status in pregnant women and child malnutrition, this area warrants further investigation in South Africa. One would need to go a step further and investigate the nutritional status of children born to HIV positive mothers, and also compare nutrition status in both HIV positive and HIV negative children.

4.4 Challenges and constraints in addressing child malnutrition at provincial level

This section presents and discusses challenges and constraints in effectively implementing DoH programmes at provincial level. Table 4.7 shows some of these general challenges and constraints.

Table 4.7: General challenges and constraints affecting the Department of Health in selected provinces (Eastern Cape DoH, 2005; Gauteng DoH, 2004; KwaZulu-Natal DoH, 2005; Mpumalanga DoH, 2002)

Problem	**Challenge or Constraint**	**EC**	**GP**	**KZN**	**MP**
Lack of capacity and skills in districts especially rural areas	Constraint	√	√	√	√
Poor infrastructure decreases accessibility to rural areas	Constraint	√	-	√	√
Skills shortage due to high HIV prevalence among health workers	Constraint	√	√	√	-
Transport shortage resulting in less supervision of programmes	Constraint	√	-	√	√
Decreased staff retention	Challenge	√	√	-	√
Insufficient collaboration between different government sectors	Challenge	√	√	-	√
Pressure on resources from cross border/boundary influx and rural-urban migration	Challenge	√	√	-	√
Reduced funding	Constraint	√	√	-	-
Non-cost effective procurement practices	Challenge	√	√	-	-
Pressure of HIV on resources and capacity of the health care system	Challenge	-	√	√	-
Inadequate systems for monitoring and evaluation	Challenge	√	-	-	√
Poor clarity of roles and policies in provinces and districts	Challenge	√	√	-	-
Weak implementation of the District Health Information System	Challenge	√	√	-	-
Poor resource allocation	Challenge	-	√	-	-

EC = Eastern Cape; GP = Gauteng; KZN = KwaZulu-Natal; MP = Mpumalanga. - ≡ challenge or constraint was not mentioned.

As shown in Table 4.7, common constraints between 2002 and 2005 were, according to the respective provincial DoH strategic plans; lack of capacity and skills; lack of infrastructure to reach remote areas; insufficient transport to supervise programmes; and skills shortages due to HIV. Three of the four provinces identified decreased staff retention, insufficient collaboration between government sectors, and the effect of cross-border influx and rural-urban migration on resources, as challenges within the running of the DoH.

Table 4.8: Challenges and constraints affecting the nutrition functions of the Department of Health in selected provinces (Gauteng DoH, 2004; KwaZulu-Natal DoH, 2005; Mpumalanga DoH, 2002)

Problem	Challenge or Constraint	GP	KZN	MP
Limited capacity to implement interventions especially at district level	Constraint	-	√	√
Shortage of experienced staff especially to implement the Integrated Management of Childhood Illnesses strategy	Constraint	-	√	√
Incomplete nutrition data or statistics to be useful for programming	Constraint	-	√	√
Increased number of HIV patients especially children needing treatment for malnutrition	Challenge	√	-	√
Poor monitoring and evaluation	Challenge	-	√	-
Inadequate budget and capacity to procure especially at the district level	Constraint	-	√	-
Inappropriate deployment of staff to areas where their skills will not be used or are less in demand	Challenge	-	-	√
Not enough health workers to provide school health services	Constraint	-	-	√
Lack of transport especially to reach peripheral communities	Constraint	-	-	√
Understanding and responding appropriately to needs of vulnerable groups	Challenge	√	-	-
Providing adequate information and education at community level	Challenge	√	-	-
Health outcomes are not always commensurate with health care	Challenge	√	-	-
Poor management of funds at intervention or project sites	Challenge	-	-	√
Poor integration of nutrition programmes with other programmes	Challenge	-	-	√

GP = Gauteng; KZN = KwaZulu-Natal; MP = Mpumalanga. - ≡ challenge or constraint was not mentioned.

Common nutrition programme-specific constraints at provincial level were limited capacity and shortage of staff to implement the IMCI strategy of the INP. Incomplete nutrition data for programming purposes were cited by KwaZulu-Natal and Mpumalanga as a constraint to successfully implementing nutrition programmes. The increase in the number of HIV positive children needing treatment for malnutrition posed a challenge at provincial level when implementing nutrition programmes because of the higher nutrition demands of this group.

As previously highlighted in section 2.7.3 of the literature review, Swart et al., (2008) identified human resources and lack of capacity as some of the significant problems faced in programme implementation in South Africa. Other areas of concern were weak coordination, inadequate strategies and funding issues (Swart et al., 2008). Based on the current analysis of the Eastern Cape, Gauteng, KwaZulu-Natal and Mpumalanga one can conclude that the challenges and constraints tend to be similar to those identified by Swart et al. (2008). There were however a few unique challenges and constraints at provincial level not previously mentioned by key authors in the South African context. For example, the effects of cross-border influxes of people on local resources were not mentioned in previous reviews. Lack of capacity within the INP to implement the IMCI was also noteworthy. The IMCI is one of the key programmes of the INP aimed at preventing, and where necessary, rehabilitating malnourished children.

Inadequate monitoring and evaluation of programmes and gaps in available data on health indicators were also important challenges identified in the analysis. Food security and nutrition policies are important for improving nutrition (Rosegrant & Meijer, 2002). A lack of monitoring and evaluation leads to lack or poor delivery of programmes.

In the context of the INP, sub-standard monitoring and evaluation of programmes over the years may have limited the impact of INP activities on child malnutrition. The minimal, and at times complete lack of improvements in important nutrition indicators may have been due to a lack of ongoing surveillance at municipal and district level. A lack of updated statistics impairs effective targeting of vulnerable children. For example, if programme officers have inaccurate information regarding the number of stunted children in a community, this may result not only in the exclusion of the most vulnerable children, but at times a community in dire need of intervention not being targeted (FAO & WHO, 1992b).

Lastly, the evaluation of provincial challenges and constraints highlighted HIV as a two-pronged problem both in implementing DoH activities and nutrition programmes. Past reviews on the nutrition system in South Africa tended to overlook the effect of HIV on nutrition. Based on the current study, HIV is in fact a major problem as it impacts on human resources and capacity to

conduct nutrition programmes. A high percentage of economically active people are infected or affected by HIV in South Africa, resulting in skills shortages in areas crucial to child nutrition. Fewer people are available to work, resulting in increased pressure on human resources within health facilities (Fox et al., 2004) and in programmes such as the INP that directly target child malnutrition.

Apart from the skills shortage due to HIV, health facilities deal with increasing numbers of HIV patients. People with HIV tend to need more specialised care, and in the case of young children, are significantly more prone to malnutrition. This phenomenon strains public resources as more interventions and personnel need to be allocated. Realising the potential of HIV to hamper progress in food security as a whole, the INP set out the need to address nutrition in HIV patients as one of the key priorities for 2002 to 2007. Although much has been done in this regard, such as the prevention of mother to child transmission (PMTCT) programme; dietary guidelines for HIV patients; and food packs for HIV positive people, the strategies do not appear to have mitigated the impact of HIV on nutritional status.

4.5 Nutrition recommendations from previous surveys and government responses

All three national nutrition surveys made recommendations to government on ways to reduce child malnutrition in South Africa. The section that follows presents the findings of an analysis of government responses to recommendations set by the SAVACG (1994) and NFCS (1999) task teams. Owing to the integrated nature of the INP and the more recent IFSS, in the current study, responses were not limited to the NDoH, but also included responses from other government sectors as relevant to the nutrition recommendations. Table 4.9 shows recommendations regarding anthropometric, vitamin A and iron status made in 1994 and 1999, and whether these were responded to or not (refer to Appendix D for recommendations and the responses in detail).

Table 4.9: Nutrition recommendations and whether they were responded to or not (SAVACG, 1994; NFCS, 1999; SAHR, 1996 – 2005; NDoH, 2002)

Indicator	Recommendation	1994	1999	Response
Anthropometric status	Stunting should be addressed as part of an integrated strategy	X	X	√
	All children with anthropometric parameters less than two standard deviations of the reference median should be targeted	X	-	√
	More emphasis should be placed on quality and micronutrient composition of supplementary and feeding programme foods	X	X	√
	Establish health facilities for intensive treatment of severely malnourished children	X	-	√
	Link income generating activities to community initiatives to improve nutrition in children	X	-	√
	Preschool children especially those under two years, should be the prime target for nutrition interventions	X	X	√
	Anthropometric assessment of children should be repeated in three years to assess progress	X	X	Delayed
	Mothers/caregivers should be trained in the rehabilitation of malnourished children	-	X	√
	Correct management of infectious diseases especially diarrhoea and HIV should form an integral part of supplementary feeding programmes	-	X	√
Vitamin A	Long term improvement of vitamin A status should be addressed within the proposed framework of an integrated strategy	X	-	√
	Institute a national vitamin A supplementation programme for all children aged six to 71 months	X	-	√
	Keep records or vitamin A supplementation	X	-	√

- ≡ recommendation was not made in that year.

Table 4.9 (continued)

Indicator	Recommendation	1994	1999	Response
Vitamin A	Give lactating mothers vitamin A supplements within a month postpartum	X	-	√
	Investigate the feasibility of fortifying foods with vitamin A	X	-	√
Iron	An iron supplementation programme should be instituted for three years primarily for children aged six to 23 months	X	-	√
	The feasibility of fortifying baby and toddler foods with iron should be investigated with the view of implementation	X	-	√
	Long term improvement of iron status in children should be addressed	X	-	√
Vitamin A and Iron	Exclusive breastfeeding should be promoted for four to six months followed by complementary feeding up to two years	X	X	√
	Staff should be trained on the importance of vitamin A and iron	X	-	√
	All children should be treated for intestinal parasitic infections	X	-	Slow
	Increase maternal education of vitamin A, iron and diet diversification	X	-	√
	Ongoing monitoring and evaluation of vitamin A and iron in children should be implemented	X	-	Slow
	Food fortification should be implemented as soon as possible	-	X	√
	Nutrition education messages must be tailored to the currently prevailing consumption patterns and desired changes	-	X	√
	A repeat survey should be conducted at the end of three years to assess progress in vitamin A and iron status of children	X	-	Delayed
	Accelerate creation of pre-schools in poor areas with meal provision	-	X	Slow
	A food consumption survey should be repeated every three to five years and cover the whole population	-	X	2005 survey covered women and children

- ≡ recommendation was not made in that year.

As can be seen in Table 4.9, government mainly through the INP and other NDoH activities appears to have addressed most recommendations regarding child nutrition that were outlined by lead investigators in the 1994 and 1999 surveys. With respect to anthropometric status, recommendations to prioritise nutrition in children under five through combating severe malnutrition; helping improve food security by linking nutrition activities with income generating activities; and promoting nutrition education were taken heed of by government. The IMCI and the PEM scheme were specifically set up to address nutrition in children under-five. However, shortages of skilled personnel to run these programmes in provinces (Tables 4.7 and 4.8) may have limited the extent to which the programmes successfully fulfilled their mandates between 1994 and 2005.

Health promotion campaigns such as breastfeeding awareness, vitamin A brochures and the South African food based dietary guidelines are among some of the initiatives that were, and continue to be undertaken by the NDoH to increase awareness of issues around child malnutrition. It is not yet clear how effective these campaigns have been, and whether nutrition knowledge has actually translated to behavioural change. Schoeman et al. (2006) found that there was poor transfer of information from health workers to caregivers. This highlights some weaknesses in staff training that may need to be addressed in the future for nutrition education or promotion campaigns to yield positive outcomes.

Community-based income generating activities have long been considered an integral part of any food security initiatives. This is because ultimately the most sustainable way to ensure ongoing food security at household level is through increased income. Money gives people access to food either through the ability to purchase food or by acquiring equipment and inputs to grow one's own food. However, this can only be achieved when markets function and affordable food is available. It is, therefore, not only paramount to include income generating projects within nutrition programmes in South Africa, but also to ensure different role players (across different sectors) are involved to get the most out of the programmes.

Initially, community-based activities were included under the INP (SAHR, 1997), but it was found that this resulted in weak collaboration with other sectors. Sectors outside of the NDoH assumed the initiatives belonged to the Nutrition Directorate, so there was minimal contribution

from these other sectors. To change this, and ensure more government departments were involved, income generating activities linked to food security were transferred in 2002 from the INP and incorporated into the more recent Integrated Sustainable Rural Development Strategy. The Nutrition Directorate continues to be involved primarily as a provider of technical support, but there is more sectoral collaboration in income generating activities (SAHR, 2002).

Vitamin A supplementation was initially implemented for three years following the findings of the 1994 survey. However, this was later revised and vitamin A supplementation for young children and antenatal women was introduced in all primary health care facilities in 2002 (SAHR, 2003/4). Another achievement of the INP was the development of the new Road to Health Chart that would allow health workers to keep records of the administering of vitamin A supplements to children visiting health facilities (SAHR, 2002). The Road to Health Chart has not only helped to monitor vitamin A supplementation programmes, but also to track coverage of the programme.

Although the SAVACG (1994) recommendation was to have a follow-up survey to assess vitamin A status in South African children three years after the 1994 survey, a repeat survey was not conducted until 2005. According to the WHO database on vitamin A (WHO, 2005), smaller surveys were conducted between 1994 and 2005. These included, for example, surveys in the Vulamehlo District (KwaZulu-Natal) in 1995, the Joe Slovo settlement (Western Cape) in 1998, Ndunakazi in KwaZulu-Natal in 1999 and Valley of a Thousand Hills in KwaZulu-Natal in 2002 were conducted between 1994 and 2005. However, none of these surveys were nationally representative, thus could not give an accurate account of vitamin A status of South African children. The NFCS in 1999 only assessed dietary intake of vitamin A rich foods, while the 2003 SADHS only investigated vitamin A supplementation programmes, but neither of these surveys assessed biochemical measurements.

Gaps in the monitoring of indicators of public health concern have a potential impact on overall success. A consequence of inadequate data is that it is difficult to measure progress and to pick up on sudden changes in nutritional status in a particular area. Up to date surveillance allows acute malnutrition, such as that due to a cholera outbreak, to be dealt with immediately. On the

other hand, if data are unavailable, an easily reversible condition becomes prolonged and eventually leads to chronic conditions.

For the most part, vitamin A deficiency doubled during the 11 year lag in following up on vitamin A status in children nationally (Figure 4.2). Had a survey been conducted earlier, it may have led to action to prevent vitamin A status deteriorating further. Similarly, more frequent monitoring of iron status in children may have alerted the NDoH and led to corrective measures being put in place earlier. A large scale follow-up survey was only conducted in 2005 even though in 1995, following a request from the Nutrition Directorate, the Nutrition Surveillance Consultancy began to develop a National Health Information System to monitor several health indicators including iron status (SAHR, 1996).

One of the achievements of the INP was the establishment of the District Health Information System (see section 2.7.3), aimed at ensuring a regular flow of information from district to provincial and national levels on key health indicators in South Africa (NDoH, 1998). Despite being formed in 1998 (SAHR, 1998), the first concise publication of health indicators at district level was only published in 2006, covering data from 2004 (HST, 2006). This indicates a lag from the inception and implementation of the District Health Information System to data actually being consolidated and made widely available.

One of the activities that was recommended to help combat micronutrient deficiencies was control of parasites in schools as part of the NSNP. However, to date, little appears to have been done to treat parasites in children. An assessment of the NSNP in several provinces (Eastern Cape, Western Cape, Limpopo, Gauteng, North West and KwaZulu-Natal) found that parasite eradication programmes (for example deworming), had not been systematically implemented in schools (SAHR, 1996). By 2000, the only provinces that had set up parasite treatment projects were Mpumalanga and KwaZulu-Natal (SAHR, 2000). The apparent lack of progress in this area may have been due to a limited capacity in terms of health workers to go to schools. Mpumalanga highlighted skills shortages as a constraint to providing health services in schools (Table 4.8). It is possible that other provinces that were not included in the current evaluation faced and continue to face a similar problem. The INP may in future need to explore other delivery modes for the control of parasitic infections.

As previously discussed, the impact of HIV on nutritional status cannot be overestimated, and because of this realization, the INP made a concerted effort to make the needs of HIV positive people integral in nutrition programmes as was recommended in 1999. The HIV and AIDS Comprehensive Plan was established to ensure that HIV was included in nutrition programmes in South Africa. For example, the Nutrition Supplementation Intervention under the Nutrition Directorate makes supplementary meals and micronutrients available to HIV infected people for the first six months of treatment. Furthermore, all children under 14 years of age who have HIV are entitled to receive monthly nutrition packs. Nutrition guidelines were also developed for people with HIV in South Africa because of the appreciation of the special dietary needs of this group. Despite these efforts by the INP, HIV is still a challenge in South Africa. The high rates of HIV in pregnant women increase the risk of HIV transmission to children, setting off even more severe malnutrition in these children.

National guidelines on the energy and micronutrient balance of food provided in feeding programmes were set by the NDoH and made available to all provincial INP departments. However, according to the 2002 publication of the SAHR, there was no evidence of any standardisation of practices among provinces in terms of quality of food provided in these programmes. For example, with respect to children aged between seven and ten years, most provinces failed to achieve the stipulated minimum of 25% of the RDA for energy in meals provided in the NSNP; micronutrient levels were also sub-optimal (SAHR, 2002). Another aspect of feeding programmes that has been widely criticized in South Africa is the fact that although the NSNP is meeting the needs of school-going children, the needs of pre-schoolers appear to have been sidelined (SAHR, 2000). In other words, under-five nutrition has been somewhat overshadowed by the NSNP. This is of concern considering that the data clearly show that the most at-risk group, and those most susceptible to both protein energy and micronutrient malnutrition, are children aged below five years of age.

Much funding has gone into the NSNP, the sustainability of which is questionable when the costs involved are considered, yet not much seems to have been done to set up feeding programmes in early childhood education and pre-school facilities. This raises the question of whether, in the

long run, it would not be more feasible for government to explore other interventions that would also encompass the nutrition needs of children under-five in a more tangible manner.

4.6 Opinions of the KwaZulu-Natal Nutrition Directorate on the findings of the study

The KwaZulu-Natal provincial Nutrition Directorate (management and advisory team) were engaged on the findings of the study to find out their opinions. The team agreed that the NSNP might have significantly contributed to improvements in the nutritional status of primary school learners. With respect to vitamin A status, particularly the sharp increase in vitamin A deficiency in children in KwaZulu-Natal compared to the rest of the country, the general sentiment was that the validity of the findings was questionable. According to the team, the methodology used to collect vitamin A data in KwaZulu-Natal, especially the lab analysis, was different to that used in the other provinces so this may have attributed to the uncharacteristically high rates of vitamin A deficiency. In their defence, the KwaZulu-Natal Nutrition Directorate highlighted that vitamin A supplementation is in place across the province. Furthermore, new born children, particularly those born to HIV positive mothers are given high dose supplementation from birth so, in their opinion, it is unlikely vitamin A deficiency is as high as 90% in the province.

The KwaZulu-Natal team agreed that inter-sectoral collaboration is important in addressing child malnutrition. However, they raised the fact that theoreticall, collaboration is the ideal yet implementing it is a challenge. From their observation, inter-sectoral collaboration worked at the grassroots level for example, nutritionists and agricultural extension officers often work together in community garden projects, but at policy level, despite the IFSS, collaboration across sectors is minimal. Lastly, the KwaZulu-Natal Nutrition Directorate disagreed with the recommendation that both increasing public awareness on food fortification and more rigorous monitoring of fortification mixes should be conducted. According to the team, the focus should just be on ensuring the micronutrient content of fortified products is compliant with regulations. The general feeling was that enough has been done with respect to educating the public on purchasing fortified maize, flour and bread. However, considering that the 2005 NFCS-FB found an increasing number of households were purchasing cake flour (not fortified in South

Africa) to bake bread at home, this warrants increasing public awareness to ensure households use fortified wheat flour for baking bread at home. This is particularly important taking into account the current sharp food price increases linked to the economic downturn. It is likely many households are opting to bake their own bread at home rather than purchase as a means to cut costs.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Study purpose and importance

The purpose of the current study was to assess the impact of the INP on child malnutrition in South Africa by considering trends in child malnutrition by province and age between 1994 and 2005. The study also set out to establish whether there was a relationship between HIV in prenatal women and rates of malnutrition in children during the same period. Challenges and constraints to implementing nutrition programmes at provincial level were assessed, and lastly, an evaluation of government responses to key nutrition recommendations from previous nutrition surveys was conducted.

5.2 Methodology

Data from three national nutrition surveys – SAVACG (1994), NFCS (1999) and NFCS-FB (2005) were used to examine trends in key child nutrition indicators by province and age. The Pearson's Correlation approach was used to determine the relationship between HIV in pregnant women and child malnutrition in 1994, 1999 and 2005. Provincial challenges and constraints were identified from provincial DoH strategic plans for the Eastern Cape, Gauteng, KwaZulu-Natal and Mpumalanga. Nutrition recommendations regarding child nutritional status were taken from the SAVACG (1994) and NFCS (1999) final reports. The responses were evaluated using the INP strategic plans and SAHR publications between 1996 and 2005.

5.3 Results

There were varied outcomes of child nutritional status both provincially and by age group in South Africa between 1994 and 2005. The rates of vitamin A deficiency and iron deficiency significantly increased across the country. On the other hand, indicators of anthropometric status tended to be more erratic and varied, depending not only on the indicator but also on the province or child age group. For example, stunting decreased in the Eastern Cape between 1994 and 2005, yet by 2005 wasting had increased to rates higher than those in 1994. More economically productive provinces such as Gauteng and Western Cape generally had lower rates

of PEM compared to provinces with larger proportions of poor households such as Limpopo, the Northern Cape and the Eastern Cape. Rates of stunting and underweight decreased in children aged four to six years and seven to nine years, while children aged one to three years remained the most vulnerable to malnutrition. Between 1994 and 2005, while there were no changes in the rates of stunting in children aged one to three years, there were increases in the rates of underweight and wasting.

There were significant positive correlations between national rates of vitamin A deficiency and national HIV prevalence in prenatal women ($p<0.01$), and between wasting in children aged one to three years and HIV prevalence in prenatal women ($p<0.05$). No correlations were observed in provinces and the other age groups.

General challenges and constraints faced by the DoH in provinces include lack of skills; poor infrastructure; skills shortages due to HIV; and the strain on resources caused by the cross-border/boundary influx of people from other provinces or countries. The main nutrition-specific challenges and constraints to implementing programmes in provinces were limited capacity; shortage of staff; incomplete nutrition data; and the higher demands of HIV positive patients.

Government, mainly through the INP, responded to most recommendations set by task teams in the SAVACG (1994) and NFCS (1999) surveys. However, follow-ups on vitamin A and iron status in children were delayed, control of parasites was also slow in being implemented, and the extent to which feeding programmes have been established in pre-school facilities across the country remains unclear.

5.4 Conclusions

Based on the above findings, it would appear that the INP had mixed impacts on child nutritional status in South Africa between 1994 and 2005. Stunting decreased in the Eastern Cape, underweight in the North West, and wasting in the Free State, but there was not a single province where there were improvements in all indicators. Primary school children showed improvements particularly in stunting, indicating that INP activities targeted at school-going children were generally successful. On the other hand, INP activities, particularly aimed at children aged under five, may not have been as well implemented or failed to yield significantly positive outcomes.

Of particular concern was the increase in micronutrient malnutrition, particularly vitamin A deficiency, which raises questions on the effectiveness of food fortification and supplementation programmes in South Africa.

HIV may have masked or prevented the full potential of the INP from being achieved between 1994 and 2005. One of the major factors may have been its direct effects on child nutritional status, and its indirect effects on the ability of the INP to drive its objectives due, for example, to skills shortages. The pool of data used for correlation was too small to make any decisive conclusions. Nonetheless, taking into account the high rates of HIV in South Africa, and the well documented impact of HIV on factors such as labour, the economy and health, it is very likely that maternal HIV status would to an extent influence nutrition outcomes in children, especially younger ones. This is confirmed by the observed positive correlation ($p<0.05$) between HIV in prenatal women and wasting in children aged one to three years.

Some of the apparent lack of success of some INP activities may have been due to several challenges and constraints faced at provincial level for example, skills shortages; lack of infrastructure; and inadequate monitoring and evaluation which were also identified by previous investigators as problems at national level.

Keeping in mind that this study primarily focused on the INP, one cannot discard the possible role of factors in the macro-environment that may not only have masked the positive outcomes of the INP, but also contributed to child malnutrition in South Africa. For example, changes in the economy, particularly food price increases, and limited access to basic sanitation, could have played a part in the child malnutrition trends observed. Considering that the INP did, for the most part, respond to recommendations from previous surveys, and made a concerted effort to direct strategies to curb malnutrition, the effect of external factors is crucial. The large range of external factors highlights the importance of inter-sectoral approaches to addressing food security.

5.5 Recommendations

Nutrition promotion and education should be continued to raise public knowledge of the importance of good nutritional status in children. Campaigns to raise awareness of food fortification should be continued.

Ongoing monitoring and evaluation needs to form an integral part of INP activities particularly in clinics and within communities. For example, monitoring of supplement distribution programmes and nutritional status of children needs to be enhanced. This will present a platform to identify problems, and take measures to rectify them in a timely manner.

More training should be provided for health workers in clinics to build capacity, especially to implement the IMCI activities, and to correctly conduct supplementation programmes. Capacity to implement parasite control programmes for children also needs to be increased. The best ways to systematically deliver the programme need to be explored, for example whether to do it in clinics or improve on the administering of health services in schools.

Government needs to intensify INP strategies related to nutrition in pre-school children, especially in children aged one to three years. This could initially involve implementing feeding programmes, similar to the NSNP, in crèche facilities nationally, while more sustainable and resource conservative approaches are investigated for the long term. Furthermore, government needs to undertake a national evaluation of the implementation of programmes targeted at children under-five years of age such as the PEM scheme. This will help identify gaps in the outputs and outcomes of these programmes and lead to more informed policy formulation and decision making for future interventions.

Government needs to continue to monitor compliance of manufacturers to food fortification regulations, particularly vitamin A and iron levels in maize and wheat flour. This can be done by rigorous spot checks of the micronutrient content of fortified foods before they are dispatched.

Considering the high HIV rates in South Africa, it would be worthwhile to have a component that includes nutrition statistics of HIV positive individuals in national nutrition surveys. This would help identify and prioritise special needs of HIV infected people, and enable revision of policies to better address the prevailing conditions.

Government needs to revise the District Health Information System to ensure all districts provide timely data on key child nutrition indicators. Furthermore, there needs to be regular dissemination of information to policy makers and other stakeholders to keep nutrition data up to date.

Lastly, collaboration between the INP and other spheres of the IFSS should continue to be promoted, and in coming years, should lead to a more inter-sectoral, holistic approach to food insecurity in South Africa.

5.6 Recommendations for further research

Future research may include assessing nutrition status of children born to HIV positive mothers in South Africa. An in-depth investigation of challenges and constraints affecting each of the focus areas of the INP within provinces could also be conducted in the future. It would also be of interest, particularly for future policy decisions, to review the extent to which the IFSS has managed to integrate issues of food security and nutrition across government sectors when compared to the INP.

5.7 Recommendations for improvements to the study

The study may have been improved by also analysing trends in child malnutrition at district level in South Africa. This would have added insight on how districts faired, and also helped identify the most vulnerable districts. However, district level data were sporadic and difficult to get hold of and thus, could not be collected within the time limits of the study.

Conducting interviews with key informants in all provinces directly involved with the INP would likely shed more light on problems faced with implementing the INP. The researcher did attempt to make contact with the provincial INP departments in this regard, but encountered difficulties in reaching the relevant parties and getting approval to conduct interviews. However, the researcher managed to engage with the KwaZulu-Natal Nutrition Directorate on findings of the study.

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APPENDIX A INP goals, objectives, strategies ad activities for 2002 to 2007

FOCUS AREA	GOAL	STRATEGIC OBJECTIVE (2002 TO 2007)	OPERATIONAL OBJECTIVE	STRATEGIES	ACTIVITIES	TARGET GROUP
MICRONUTRIENT MALNUTRITION CONTROL	Prevention, reduction and control of micronutrient deficiencies	Elimination of Micronutrient deficiencies among the population, focusing on vulnerable populations or groups especially: • Child vitamin A deficiency from 33.3% to 19% • Child iodine deficiency from 10.6% to 5% • Child iron deficiency from 10% to 7.5% To decrease the proportion of children with an intake of <50% of the recommended levels of vitamins and minerals from 50% to 40% To contribute to increasing proportion of households consuming adequately iodised salt from 62% to 80%	To develop and implement an Integrated Micronutrient Control Strategy To implement support systems	Strategies to prevent, reduce or control dietary deficiencies of vitamins and minerals through direct supplementation of vulnerable populations or groups with micronutrient supplements, dietary diversification and fortification of commonly consumed foods with micronutrients	Dietary Diversification Micronutrient Supplementation Food fortification Nutrition promotion, education and Advocacy Supporting and promoting agricultural and horticultural interventions to increase the availability of micronutrient rich foods Quality control of food Linkages with other public health measures i.e. immunisation, parasite control, promotion of breastfeeding	Vitamin A Supplementation: All post-partum Women Children zero to five years Food fortification: Population Health workers Industry
GROWTH MONITORING AND PROMOTION	Contribution to optimal growth of infants and young children	To prevent and reduce growth faltering among children zero to 24 months of age through regular growth monitoring and promotion To ensure that at all new born babies are provided with a Road to Health Chart	To provide provincial nutrition units with Road to health Charts for growth monitoring and promotion To build the capacity of health workers on growth monitoring and promotion	Regular measurement, recording, and interpretation of a child's growth over time in order to counsel, act and follow up results with the purpose of promoting child health, human	Provision of Road to Health Chart to all children under two years Regular growth monitoring through measurement, recording and interpretation of child growth Detection of disease,	Population Care givers of infants and young children Health workers

			To promote growth monitoring and promotion	development and quality of life	growth faltering and malnutrition Promotion of growth Counselling of care Givers	
FOOD SERVICE MANAGEMENT	Contribution to the institutional care of clients through food service systems for the provision of balanced nutrition	To ensure that clients of at least 80% of public institutions receive meals that are acceptable (including culturally acceptable) and adequate in quality and quantity	To facilitate and coordinate Food Service Management To develop and implement Food Service Management Implementation Guidelines	Planning, development, control, implementation and evaluation of and guidance in respect of suitable food service systems (procurement, storage, preparation and service of foods and beverages) for the provision of balanced nutrition to groups in the community and in public institutions for healthy and/or ill persons	Provision of meals Maintaining food service systems Technical support by dietitians	Clients of public institutions Health workers
PROMOTION, PROTECTION AND SUPPORT OF BREASTFEEDING	Contribution to child survival and maternal health	To increase the proportion of mothers who breastfeed their babies exclusively for six months from 7% to 10% To increase the proportion of mothers who continue to breastfeed their babies with appropriate complementary foods up to 24 months of age and beyond To ensure that mothers of infants under 24 months who	To formulate and implement a legislative framework for the promotion, protection and support of breastfeeding To implement activities that will promote, protect and support breastfeeding To coordinate the implementation of	Facilitation of practices and behaviours in health care settings to protect, promote and support Breastfeeding Building on good practices and removing constraints and discouraging practices that are detrimental to establishing, maintaining or	Baby Friendly Hospital Initiative Implementing the Code on the Marketing of Breast Milk Substitutes Provision of information and support to care Givers Nutrition education, promotion ad Advocacy	Pregnant and breastfeeding Women Infants Health workers Industry Public institutions

		are not breastfeeding, practice appropriate replacement feeding options To ensure that at least 15% of health facilities with maternity beds are baby-friendly	Baby Friendly Hospital Initiative in health facilities with maternity beds To provide input on replacement feeding aspect of Prevention of Mother to Child Transmission Programmes To provide support on training on infant feeding options	sustaining breastfeeding Provide appropriate information and adequate support to mothers where breastfeeding is contra-indicated to enable them to make decisions on feeding options for their infants and to ensure it is successfully carried out	Support groups Lactation Management Supportive Monitoring	
CONTRIBUTION TO HOUSEHOLD FOOD SECURITY	Contribution to the improvement of household food security	To ensure that other sectors dealing with household food security receive adequate technical support and advice on nutrition To ensure that Integrated Sustainable Rural Development Nodal Sites have nutrition activities incorporated into their Integrated Food Security and Nutrition Projects To alleviate short-term hunger among primary school learners	To participate in and support the development and implementation of an Integrated Food Security and Nutrition Programme To facilitate the effective and efficient implementation of school feeding to ensure 100% coverage compliance of actual servings for school feeding with the requirements and specifications of the standardized menu options	Nutrition-related activities to contribute to adequate access by households to amounts of foods of the right quality to satisfy the dietary needs and to ensure a healthy active life of all household members at all times throughout the year	Nutrition education, promotion ad advocacy Technical support and nutritional advice to other sectors dealing with household food security School feeding	Nutritionally vulnerable groups and individuals Inter- and intra-sectoral partners
NUTRITION INFORMATION SYSTEM	Efficient and effective nutrition information system for planning, policy formulation and management	To assess the nutritional status of the population through regular surveys To continuously collect, analyse and utilize data on specific nutrition indicators to monitor the nutritional status of the population To implement a minimum data set to manage information for programme	To conduct, facilitate and coordinate appropriate nutrition surveys To monitor the nutritional status of South Africans To monitor and report on the implementation of the INP To evaluate the	Surveys Surveillance Management information Monitoring Evaluation Research	Conducting/outsourcing surveys Using the District Health Information System to monitor the nutritional status of the population Monitoring visits and assessments Data collection, collation and reporting	Decision makers Management Population

		development, implementation, monitoring and evaluation	processes, outputs and outcomes of the INP To conduct, facilitate and coordinate appropriate research according to the needs of the INP		Conducting or outsourcing research	
HUMAN RESOURCE PLAN	Effective and efficient management and development of human resources for the INP	To develop and implement the INP human resource plan to ensure that 100% of posts are filled, 100% of new staff completed the induction course and 70% of staff received in-service training	To develop and implement a HRP for the INP To facilitate and coordinate the human resource management activities of the INP To facilitate and coordinate human resource development of nutrition staff To technically support nutrition units with the implementation of the INP through visits and regular operational meetings	Assisting nutrition managers at the different levels of health management structures to coordinate programme activities and to meet the INP goals and objectives by having the right number of people with the right competencies in the right place at the right time. Human resource Management Human resource development	Recruitment, placement, remuneration and performance management of staff Capacity building and training	Management
FINANCIAL AND ADMINISTRATIVE SYSTEM	Efficient and effective financial management and administration in support of nutrition goals and objectives	To adhere to the requirements of the Financial Management Act and the Distribution of Revenue Act by ensuring 100% expenditure in terms of Conditional Grant, at least 80% expenditure in terms of Poverty Relief Allocation and best practices in most provinces	To maintain an effective and efficient administrative system for the INP To facilitate and coordinate planning processes for the INP To administer the normal budget allocation for Nutrition To administer the INP Conditional	Financial Management Planning Administration	Management of financial allocations, expenditure, assets and liabilities Office administration Conducting strategic, operational and programme planning	Management Treasury Public (Tax payers)

			Grant Allocation To administer the Special Allocation for Poverty Relief To review the financial measures for the funding of activities across the scope of the INP			
DISEASE-SPECIFIC NUTRITION SUPPORT, TREATMENT AND COUNSELLING	Contribution to the prevention and reduction of morbidity and mortality rates due to malnutrition, nutrition-related diseases of lifestyle, communicable and infectious diseases and debilitating conditions	To contribute to reduction in: • Low birth weight from 8% • Underweight in pregnant and lactating women To contribute to reduction of malnutrition in children under five years of age, specifically of: • Underweight from 10.3% to 8% • Severe underweight from 1.4% to 1% • Stunting from 21.6% to 18% • Wasting from 3.7% to 2%. To contribute to reduction of under-five mortality from 61/1000 To contribute to reduction of morbidity and mortality associated with nutrition-related diseases of lifestyle, specifically: • Overweight children from 6% to 4% • Overweight adolescent males from 5.3% to 3% and Adolescent females from 17.6% to 15% • Obesity among Adolescent males from 2% to 1% and among adolescent females from 5.9% to 4% • Overweight among adult males from 19.8% to 15% and among adult females	To formulate and implement national therapeutic dietary protocols and guidelines for disease- specific nutrition support, treatment and counseling	Nutrition and dietetic practices for the prevention and rehabilitation of nutrition-related diseases and illnesses through counselling, support and treatment	Strengthening nutritional management in the IMCI Inter-sectoral action e.g. providing water and sanitation Nutrition support, treatment and counselling during disease Growth monitoring Promotion, protection and support of breastfeeding Encouraging appropriate feeding during illness and recovery Nutrition education Dietary modification Management of malnutrition and severe malnutrition Follow up actions Referrals Support groups	Malnourished Persons Health workers Persons suffering from nutrition-related diseases of lifestyle People living with HIV/AIDS, tuberculosis and other communicable diseases and chronic debilitating conditions

		from 26.1% to 20% • Obesity among adult males from 9.3% to 7% and among adult females from 30.1% to 25% • Coronary heart disease, Hypertension, Diabetes mellitus To contribute to reduction of morbidity and mortality of people with tuberculosis, HIV/AIDS and other chronic debilitating conditions				

APPENDIX B INP long, medium and short term strategies

Ten point plan – Focus areas for key medium term strategic priorities

1. Improve governance and management of the national health system

- Community Health Worker's Programme

2. Promote healthy lifestyles

- Support healthy lifestyles campaign
- South African Food-based Dietary Guidelines
- Guidelines for youth and adolescent health

3. Contribute towards human dignity by improving quality of care

- Implementation of health promotion and quality assurance centres

4. Improve management of communicable diseases and non-communicable illnesses

- Food fortification programme
- Vitamin A supplementation
- HIV and AIDS Comprehensive Plan
- Road to Health Chart
- Integrated Management of Childhood Illnesses
- School health services

5. Strengthen primary health care, emergency health services and hospital service delivery systems

- Baby-friendly Hospital Initiative
- Food Service Management

6. Strengthen support services

- Integrated food control system

7. Prepare and implement legislation

- Guidelines for the registration of complementary medicines
- Regulations relating to foodstuffs for infants and young children

8. Strengthen international relations

- Linkages with WHO, World Trade Organisation, FAO, UNICEF
- Agreements on food control

Key short term strategic priorities (2005-2006)

1. Improve governance and management of National Health System

Regulatory framework and policy

- National Health Act, regulations and implementation
- Review extent to which legislation is assisting in realising policy
- Integrated planning, budgeting and monitoring of provinces
- Strengthen performance appraisal and management system
- Strengthen managerial skills to improve service delivery, competency, time managing and management retention strategy

2. Promote healthy lifestyles

Regulatory framework

- Regulations on foodstuffs for infants and young children
- Food-based dietary guidelines

Raising awareness

- Regulations on foodstuffs
  Breastfeeding promotion

  Safe infant feeding

- Dietary guidelines
  Healthy eating

  Physical activity

- School health policy/ Health promoting schools
- Health promotion campaigns

Training

- Regulations on foodstuffs
  Community health workers

  Health care professionals and non-government organisations

- Dietary guidelines
  Guidelines for health care professionals

  Guidelines and campaigns for community health workers

  Guidelines and campaigns for health promoters

3. Contribute towards human dignity by improving quality care

Regulatory framework and policy

- Align policies and strategies with Bill of Rights, Patients Rights Charter and Health Act
- Develop systems for improving and assuring standards of care
  Quality assurance and enforcement frameworks
- Primary health care
  Improve referral systems
- Strengthen clinic supervision and support
- Implementation of health promotion and quality assurance centres

4. Improve management of communicable and non-communicable illnesses

Management, training, monitoring and evaluation

- Surveillance
- Training
- Management of information
- Strengthen monitoring (food fortification, vitamin A supplementation)

5. Strengthen primary health care, emergency health services and hospital service delivery systems

Regulatory framework and policy

- Primary health care
  Implementation of primary health care package

  Support for primary health care in rural areas (service delivery in nodal sites)

  Community health workers and home-based care
- Hospital service delivery
  Implement Baby-friendly Hospital Initiative (facility assessment)

  Develop systems for improving food quality (food service management)
- Emergency health services
  Emergency feeding

APPENDIX C Pearson's correlation coefficients (r) between prevalence of HIV in prenatal women and child malnutrition in provinces and by age group

Eastern Cape

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	-0.968 (0.162)			
Underweight	-0.808 (0.401)	0.930 (0.239)		
Wasting	0.345 (0.776)	-0.098 (0.938)	0.274 (0.824)	

Free State

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	0.059 (0.962)			
Underweight	0.927 (0.245)	0.430 (0.717)		
Wasting	-0.969 (0.160)	0.191 (0.878)	-0.804 (0.405)	

Gauteng

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	0.738 (0.471)			
Underweight	0.426 (0.720)	0.925 (0.249)		
Wasting	0.751 (0.459)	0.110 (0.930)	-0.277 (0.821)	

KwaZulu-Natal

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	0.126 (0.920)			
Underweight	0.661 (0.540)	0.828 (0.380)		
Wasting	0.407 (0.733)	0.957 (0.186)	0.954 (0.193)	

Limpopo

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	-0.806 (0.403)			
Underweight	-0.154 (0.902)	-0.460 (0.695)		
Wasting	0.098 (0.937)	-0.668 (0.534)	0.968 (0.161)	

Mpumalanga

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	-0.107 (0.932)			
Underweight	0.366 (0.761)	-0.964 (0.170)		
Wasting	0.860 (0.341)	-0.600 (0.590)	0.790 (0.420)	

Northern Cape

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	0.696 (0.510)			
Underweight	0.987 (0.102)	0.572 (0.612)		
Wasting	0.997 (0.051)	0.636 (0.561)	0.997 (0.051)	

North West

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	-0.757 (0.453)			
Underweight	-0.099 (0.937)	0.726 (0.483)		
Wasting	-0.367 (0.761)	0.886 (0.307)	0.962 (0.176)	

Western Cape

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	0.021 (0.987)			
Underweight	0.765 (0.446)	0.660 (0.541)		
Wasting	0.811 (0.397)	-0.568 (0.616)	0.244 (0.843)	

Children aged four to six years old

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	-0.965* (0.035)			
Underweight	-0.947 (0.035)	0.904 (0.096)		
Wasting	0.946 (0.054)	-0.983 (0.017)	-0.826 (0.174)	

* Significant at $p<0.05$

Children aged seven to nine years old

	HIV prenatal	Stunting	Underweight	Wasting
HIV prenatal				
Stunting	-0.965 (0.170)			
Underweight	-0.956 (0.189)	1.000* (0.019)		
Wasting	0.728 (0.481)	-0.883 (0.311)	-0.897 (0.292)	

* Significant at $p<0.05$

APPENDIX D Nutrition recommendations and responses

Recommendation: Stunting should be addressed within the proposed framework of the Nutrition Committee regarding an integrated nutrition strategy for South Africa. The strategy should include health facility and community-based nutrition programmes; nutrition promotion, advocacy and communication; national nutrition surveillance for growth monitoring; legislation, policy and regulations to improve nutrition ;and human resource development (SAVACG, 1994). **Response:** The Integrated Nutrition Programme (INP) was introduced in 1995 with a mandate to address malnutrition primarily stunting, wasting and underweight in children. The eight focus areas of the INP were based on the above 1994 recommendations (NDoH, 1999).
Recommendation: All children with anthropometric parameters less than two standard deviations of the reference median should be targeted (SAVACG, 1994). **Response:** A strategic objective of the INP is to reduce the number of malnourished children under five and the performance indicator is a decrease in the proportion of children with anthropometric parameters (stunting, underweight and wasting) below two standard deviations of the reference median (NDoH, 2002).
Recommendation: More emphasis should be placed on quality and micronutrient composition of supplementary foods not just the energy content (SAVACG, 1994). **Response:** In 2002 the Nutrition Directorate embarked on a programme to standardise the food service manuals and guidelines for all institutions (SAHR, 2002).
Recommendation: Establish health facility based rehabilitation centres for intensive treatment, supervision and follow-up of severely malnourished children (SAVACG, 1994). **Response:** In 2002 the Integrated Management of Childhood Illnesses to combat severe malnutrition in children was implemented (SAHR, 2002).
Recommendation: Link income generating activities to community initiatives to improve nutrition in children (SAVACG, 1994). **Response:** The INP set a long term objective in 1994 for each health district to establish two community-based projects by 2001 to improve household food security through income generating projects. Furthermore, the Poverty Alleviation Fund provides funding for food security-related income generation projects (SAHR, 1996; SAHR, 1997).
Recommendation: Pre-school children especially those under two years of age should be the prime target for nutrition interventions (SAVACG, 1994). **Response:** Several focus areas of the INP for example growth monitoring and breastfeeding prioritise nutrition in children under two years (NDoH, 2002).
Recommendation: Anthropometric assessment of pre-school children should be repeated in three years to view or assess progress (SAVACG, 1994). **Response:** The National Food Consumption Survey was conducted in 1999 and this assessed anthropometric status of children aged between one and nine years (NFCS, 1999).

Recommendation: Long-term improvement of vitamin A status of children should be addressed within the proposed framework of the Nutrition Committee regarding an integrated nutrition strategy for South Africa (SAVACG, 1994). **Response:** The Integrated Nutrition Programme (INP) was established in 1994 and the Integrated Micronutrient Control Strategy was formed as part of the INP to address micronutrient deficiencies. The Integrated Micronutrient Control Strategy comprises, among others, strategies to prevent, reduce or control vitamin A deficiency through direct supplementation of vulnerable groups, dietary diversification and fortification (SAHR, 1996).
Recommendation: Institute a national vitamin A capsule distribution programme for all children six to 71 months of age starting with the provinces at highest risk (SAVACG, 1994). **Response:** Vitamin A supplementation programme in children zero to five years as part of the INP micronutrient malnutrition control (SAHR, 2000; NDoH, 2002).
Recommendation: Give lactating mothers a single high dose vitamin A supplements within the first month post partum (SAVACG, 1994). **Response:** Vitamin A supplementation programme in all postpartum women at clinics as part of the INP micronutrient malnutrition control focus area (NDoH, 2002).
Recommendation: Feasibility of fortifying foods with vitamin A in adequate amounts for children at-risk should be investigated with a view to implement (SAVACG, 1994). **Response:** In August 1996 the National Department of Health (NDoH) in collaboration with the Health Systems Trust and the International Micronutrient Initiative began to develop a plan for a national fortification programme (SAHR, 1996).
Recommendation: Repeat the survey after three years to assess progress in vitamin A status of children (SAVACG, 1994). **Response:** It was only in the 2005 National Food Consumption Survey-Fortification Baseline that the parameters measured in 1994 with respect to vitamin A status were repeated in children nationally in South Africa (NFCS-FB, 2005).
Recommendation: Keep records of vitamin A supplementation (SAVACG, 1994). **Response:** By 2002 the NDoH had developed a new Road to Health Chart for growth monitoring in children and it included a vitamin A supplementation table for health workers to record vitamin A administration. This chart is now used universally in all public hospitals and clinics in South Africa (SAHR, 2002).

Recommendation: An iron supplement distribution programme should be instituted for three years primarily for children six to 23 months of age, and when necessary, in children 24 to 71 months following a screening test (SAVACG, 1994). **Response:** A policy document on iron supplementation was released in 1997. The Integrated Nutrition Programme as outlined in its strategies introduced iron supplementation in targeted groups as recommended (SAHR, 1997; NDoH, 1999).
Recommendation: Feasibility of fortifying baby and toddler foods with iron should be investigated with a view of implementation (SAVACG, 1994). **Response:** In August 1996 the National Department of Health (NDoH) in collaboration with the Health systems Trust and the International Micronutrient Initiative began to develop a plan for a national fortification programme (SAHR, 1996).
Recommendation: Long term improvement of iron status in children should be addressed (SAVACG, 1994). **Response:** By 1997 the NDoH had introduced a national policy document on iron supplementation (SAHR, 1997).
Recommendation: A repeat survey should be conducted at the end of the three years of iron supplementation (SAVACG, 1994). **Response:** A repeat of the 1994 survey on a national scale was only conducted in 2005 to assess iron status in children (NFCS-FB, 2005).

Recommendation: Breastfeeding should be promoted (SAVACG, 1994). **Response:** In 1995, the Baby Friendly Hospital Initiative to promote breastfeeding had been fully launched in South Africa and breastfeeding policy guidelines were launched by the Nutrition Directorate in 2000 (SAHR, 2002). By the end of 2003, over ninety of the four hundred and eighty facilities that deliver babies in South Africa were registered as Baby Friendly hospitals or clinics (SAHR, 2003/4). Legislation on the Code of Ethics for the Marketing of Breast milk Substitutes is in place and breastfeeding is also addressed in the recent Infant and Young Child Feeding Policy (SAHR, 2003/4).
Recommendation: Staff should be trained on supplementation (dosage, administration etc.); the importance of vitamin A in combating infections; iron in childhood development and monitoring and evaluation of micronutrient status (SAVACG, 1994). **Response:** By 1997, policy documents on both vitamin A and iron were being developed as well as a brochure on vitamin A deficiency for health workers (SAHR, 2002). The policy on vitamin A supplementation was launched in April 2000 (SAHR, 2000).
Recommendation: All children should be treated for intestinal parasitic infections (SAVACG, 1994). **Response:** One of the activities of the micronutrient malnutrition control strategy of the Integrated Nutrition Programme (INP) is to increase linkages with other public health measures including parasite control to help decrease micronutrient deficiencies (NDoH, 1999; NDoH, 2002).
Recommendation: Increase maternal education and public awareness of the importance of vitamin A and iron. Nutrition education at household level with respect to dietary diversification and improving diet quality to increase vitamin A and iron intake should be prioritised (SAVACG, 1994). **Response:** In almost all the focus areas of the INP, maternal education is emphasised as one of the key activities to improving child nutrition status. A Food Fortification Communication Strategy was implemented in 2002 to inform the public on the importance of micronutrients (NDoH, 2002; SAHR, 2002).
Recommendation: Ongoing monitoring and evaluation of vitamin A and iron status in children should be implemented (SAVACG, 1994). **Response:** In 1998, the District Health Information System began to be established in most provinces for ongoing surveillance of health and nutrition indicators (including vitamin A and iron status) in young children at local health facilities (SAHR, 1998).

Recommendation: Intensified nutrition interventions are needed for children aged one to three years and the mothers/caregivers should be targeted for nutrition promotion. These interventions should be concurrently achieved within existing health facility and community-based nutrition programmes (NFCS, 1999). **Response:** The Integrated Nutrition Programme (INP) ranked health promotion and decreasing child malnutrition first and fifth respectively, in its key long term strategic priorities (2004 to 2009) (NDoH, 2002).
Recommendation: Correct management of infectious diseases especially diarrhoea and HIV should form an integral part of supplementary feeding programmes (NFCS, 1999). **Response:** The Integrated Management of Childhood Illnesses was introduced to address malnutrition due to diarrhoea (SAHR, 2002). The 2002 INP Strategic Plan includes the implementation of the HIV and AIDS Comprehensive Plan as a medium term priority and the long term plan to reduce HIV through nutrition interventions (SAHR, 2005).
Recommendation: In terms of priorities, all children who are stunted should be targeted according to prevalence and prevailing provincial priorities (NFCS, 1999). **Response:** Each province implements its own INP strategies based on the key identified areas that need targeting in children (NDoH, 1999).
Recommendation: Mothers/caregivers should be trained in the rehabilitation of their malnourished children (home-based rehabilitation) (NFCS, 1999). **Response:** By 2002, there were guidelines for prevention and management of malnutrition through nutrition interventions and training manuals for health workers to use to educate mothers on rehabilitating malnourished children (SAHR, 2002). A short term strategy of the INP (2004 to 2005) was to raise awareness on breastfeeding and safe infant feeding through health promotion campaigns (NDoH, 2002).
Recommendation: Anthropometric assessment of children in the age range of the present survey should be repeated in three to five years (NFCS, 1999). **Response:** The National Food Consumption Survey Fortification Baseline in 2005 investigated anthropometric status in children aged one to nine years nationally (NFCS-FB, 2005).

Recommendation: Food fortification should be implemented as soon as possible (NFCS, 1999). **Response:** Food fortification legislation – by March 2003 it was mandatory to fortify maize and wheat flour with selected micronutrients (SAHR, 2005).
Recommendation: Current menus of the primary school nutrition programme, protein energy malnutrition scheme and crèches should be reviewed with a view to improve diet variety and quality of the foods used (NFCS, 1999). **Response:** In 2002 the Nutrition Directorate embarked on a programme to standardize food service manuals and guidelines for all institutions (SAHR, 2002). A medium term priority for the Integrated Nutrition Programme (INP) in 2004 was to strengthen support systems by implementing an Integrated Food Control System (NDoH, 2002).
Recommendation: Nutrition education messages must be tailored to currently prevailing consumption patterns and desired changes (NFCS, 1999). **Response:** South African Food Based Dietary Guidelines were developed based on the nutrition status and trends in the country (NDoH, 2002).
Recommendation: Creation of pre-school facilities for children in poor areas is strongly recommended and should provide meals especially to children with working mothers in rural and high risk peri-urban areas of the country (NFCS, 1999). **Response:** No documentation was found to indicate how well this recommendation was responded to.
Recommendation: Exclusive breastfeeding for four to six months should be promoted and implemented, and complementary feeding with breastfeeding for up to the age of two should form the cornerstone in the nutrition of young children (NFCS, 1999). **Response:** Among the key INP objectives in the breastfeeding focus area for 2002 to 2007 were to increase the proportion of exclusively breastfed children from 7% to 10%, and to increase the proportion of children that continue to be breastfed while also being complementary fed up to two years of age (NDoH, 2002).
Recommendation: A food consumption survey should be repeated every three to five years and be extended to cover the whole population for the purpose of establishing baseline data and for monitoring and evaluation (NFCS, 1999). **Response:** The 2005 National Food Consumption Survey Fortification Baseline assessed nutrition in children aged one to nine years and women of child-bearing age (16 to 35 years) (NFCS-FB, 2005).